A Pilot Biodiversity Study of the eastern Frontier Closed Area and North East New Territories, Hong Kong, June-December 2003

A waterfall at Ng To, Kuk Po

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A Pilot Biodiversity Study of the eastern Frontier Closed Area and North East New Territories, June-December 2003

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Executive Summary

A 7-day preliminary biodiversity survey was conducted between June and December 2003 at Lin Ma Hang and San Kwai Tin in the Frontier Closed Area (FCA), and Kuk Po, So Lo Pun and Yung Shue Au in North East New Territories (NENT). The aim of this survey was to provide up-to-date ecological background information relevant to an evaluation of ecological importance of potential ecological hotspots in the study area. Included in the study were surveys of plants, mammals, birds, amphibians and reptiles, freshwater fish and macro-invertebrates.

At Lin Ma Hang, botanical hotspots included the *feng shui* woods and secondary forest, where forest-dependent birds including the Orange-headed Thrush were recorded. *Gymnosphaera metteniana*, a new fern species to Hong Kong, was recorded in the secondary forest. The present survey also reinforces earlier findings of high ecological value of lowland streams for freshwater fish, and lowland habitats for bats. A dragonfly, *Idionyx victor*, of "Local Concern", was also recorded. At San Kwai Tin, the endemic Anderson's Stream Snake of "Potential Global Concern", and Mountain Wolf Snake and Diamond-backed Water Snake both of "Local Concern" were recorded. Three Hong Kong endemic moths were also recorded during a light trap exercise. A dragonfly, *Gynacantha subinterrupta*, of "Local Concern' was recorded.

At Kuk Po, a total of nine plant species of conservation concern were recorded. The present survey reinforced earlier findings that a *feng shui* wood at San Uk Ha is of high conservation value. At So Lo Pun, the Yellow-bellied Weasel and Crab-eating Mongoose of "Local Concern" were recorded by infrared camera exercises. The highest occurrence of mammals occurred at Yung Shue Au. In addition, the presence of the goby *Stiphodon* sp., which is of "Global Concern", at Yung Shue Au is the first record of this fish species in the New Territories.

Designating Country Park and Site of Special Scientific Interests status to lowland habitats of high ecological value is the most effective way to conserve these habitats. Priority for conservation should be given to the secondary forest and lowland streams at Lin Ma Hang, secondary forest and hillstream at San Kwai Tin, San Uk Ha feng shui wood at Kuk Po, secondary forest, the lowland stream/marsh, and seagrass at So Lo Pun, and the lowland stream at Yung Shue Au. Green corridors between Wutongshan National Forest Park in Shenzhen and Robin's Nest in Hong Kong are recommended, this will require cross-border cooperation, and will enhance movement and dispersal of wildlife between the Hong Kong and Shenzhen mountain ranges.

1. INTRODUCTION

1.1.1 In the second stage of the Planning Department's HK 2030: planning and vision, the opening up of the Frontier Closed Area (FCA) for development was one of the foci of this stage of consultation in 2002. The opening up FCA is of concern as certain potentially ecologically important areas, especially in the valley bottom, are prime lands for development. For example, Lin Ma Hang is extremely important to freshwater fish and bats in accordance with available information (Ades 1995; Chan 2001). Also, there is a general lack of ecological baseline information as only a few studies have been carried out, especially in areas surrounding the Starling Inlet. The opening up of Sha Tau Kok within the boundary of the FCA might also lead to the development of pocket areas outside the FCA in North East New Territories (NENT), as they were connected with Sha Tau Kok socially and geographically prior to the abandonment of some these villages in the 1970s.

1.1.2 In June and July 2003, the media reported that the Government of the Hong Kong Special Administrative Region were considering the opening up of Sha Tau Kok for tourism (*Mingpao* dated 5 June 2003, *The Sun* dated 16 July 2003). This proposal is supported by a Tourism Board commissioned study on the development of tourism in the Northern NT, stating the FCA at Sha Tau Kok was recommended to be opened up for group tours (Anon 2003). This study also suggested that tours to the abandoned Lin Ma Hang lead mine, which is designated as a Site for Special Scientific Interest (SSSI) for bats, should be operated. There is a real risk of the degradation of unprotected and protected areas in NENT by increasing human activities. In addition, Lin Ma Hang is also identified as one of the potential terminals of the Eastern Express on the Hong Kong side.

1.1.3 Although both the inland of Kuk Po, So Lo Pun, and Yung Shue Au falls outside the boundary of FCA, the opening up of Sha Tau Kok might lead to the re-development of these indigenous villages, as these areas are connected with Sha Tau Kok socially and geographically. In March 2002, a joint letter from various villages in NENT suggested that eco-tourism should be promoted in these areas. However, inappropriate tourism development in ecologically sensitive areas would lead to disturbance of local wildlife, and would be likely to result in degraded habitat quality due to erosion, litter and pollution. A large influx of visitors to these pocket areas in the NENT is expected as a result of the opening up of Sha Tau Kok. Information collected from the present study will help to chart the proper eco-tourism development in the area.

1.1.4 In view of the above development and the gaps in our knowledge regarding wildlife distribution in Lin Ma Hang and San Kwai Tin within the Frontier Closed Area boundary and NENT, a pilot study of biodiversity was conducted. This was to provide up-to-date data to prioritize ecological hotspots in the study area and to support the drafting of a conservation plan of sensitive sites. It also provides a general indication of the overall conservation value of this part of Hong Kong.

Nature and purpose of this project

1.2 This project involves rapid floral and faunal surveys in the FCA and three unprotected areas near the Starling Inlet in NENT. The aim of the study was to identify ecological hotspots and to locate species of conservation concern. The survey was undertaken by experts from KFBG. Voluntary assistance with the avian survey was provided by Dr Kwok Hon Kai from a local ecological consultant.

Past ecological studies in eastern FCA and NENT adjacent to Starling Inlet

1.3 Relatively less attention has been given by ecologists to this part of Hong Kong, probably due to its limited accessibility. Nevertheless, at least nine surveys have been conducted in this area since the 1990s. All of these studies have focused on species distribution and none of them have covered the entire area. For instance, no survey of mammals, birds, amphibians, reptiles, freshwater fish and macro-invertebrates have been conducted at Kuk Po, Fung Hang and Yung She Au. The following table summarizes previous ecological studies conducted near Starling Inlet.

Table 1. Past ecological studies within the study area (LHM: Lin Ma Hang, SKT: San Kwai Tin, KP: Kuk Po; SLP: So Lo Pun and YSA: Yung Shue Au).

Study	Study period	Nature of studies	Locations in the present study				
			LMH	SKT	KP	SLP	YSA
Ades (1994)	1990-1994	Bat ecology and distribution	+				
Lau (1998)	1991-1997	Amphibian ecology and distribution	+				
Dudgeon and Chan (1996)	1994-1995	HKU Wetland Survey of wetland flora and fauna, in particular macro-invertebrates			+		
Wilson (1997)	1991-1997	Dragonflies distribution			+		
Carey *et al*. (2001)	1993-1996	Breeding Bird Survey	+	+	+	+	+
Yip (2000)	1996-1997	HKU Biodiversity Survey	Flora				
			+	+			
			Fauna				
			+				
			Ant				
			+		+		
Wong (1999)	1997-1998	Wetland bird survey			+	+	+
Chan (2001)	1998-2001	Freshwater fish distribution	+	+		+	
Zhang (2001)	1997-2000	Moss distribution		+		+	
Lau (unpublished)		Reptile distribution	+				

Similar projects undertaken in the past or ongoing

1.4 HKU Biodiversity Survey undertaking during the mid 1990s touched on the study area. Currently, AFCD is conducting a baseline biodiversity survey that also includes sites within the area. The Hong Kong Bird Watching Society (HKBWS) has been conducting a "Winter Bird Atlas" survey covering the entire FCA since 2001. The Wildlife Conservation Foundation is planning to conduct mammal surveys in the FCA near Lin Ma Hang

Location and coverage

(i) Lin Ma Hang / San Kwai Tin

1.5.1 Lin Ma Hang and San Kwai Tin are situated on the northern slopes of Robin's Nest in the NENT (Figure 1). Both areas fall within the boundary of FCA. The approximate survey area of Lin Ma Hang is 219 ha, while San Kwai Tin is 26 ha. The following tables summarize habitats surveyed by each group at Lin Ma Hang and San Kwai Tin.

Table 2A. Habitats surveyed by each taxa group, and the survey dates for Lin Ma Hang

	Secondary forest	*Feng shui* woods	Abandoned farmlands	Lowland stream	Survey date(s) in 2003
Plants	+	+	+	+	10 Jul
Infrared camera exercise	+				10-28 Jul
Birds	+	+	+	+	10 Jul and 13 Nov

	Secondary forest	*Feng shui* woods	Abandoned farmlands	Lowland stream	Survey date(s) in 2003
Amphibians and reptiles	+	+	+	+	10 Jul
Butterflies	+	+	+	+	10 Jul
Dragonflies	+	+	+	+	10 Jul
Freshwater fish				+	10 Jul

Table 2B. Habitats surveyed by each taxa group, and the survey dates for San Kwai Tin

	Secondary forest	Abandoned farmlands	Hillside stream	Lowland stream	Survey date(s) in 2003
Amphibians and reptiles	+	+	+	+	10 Jul
Dragonflies				+	10 Jul
Freshwater fish				+	10 Jul
Moths	+		+		10 Jul

(ii) Kuk Po

1.5.2 Kuk Po (approximate 61.5 ha) is situated in the northeast coast of Starling Inlet (Figure 1). The coast and upland of Kuk Po falls within the boundary of FCA and Plover Cove Country Park, respectively. Currently, there is no vehicular access to Kuk Po. The following table summarizes the surveyed habitats covered by each taxa group at Kuk Po

Table 3. Habitats surveyed by each taxa group, and the survey dates for Kuk Po

	Secondary forest	*Feng shui* woods	Abandoned farmlands	Lowland stream	Reedbed and freshwater marsh	Survey date(s) in 2003
Plants	+	+	+	+		19 Jun
Infrared camera exercise	+	+				1-15 Aug
Birds	+	+	+	+	+	6 Nov

(iii) So Lo Pun / Yung She Au

1.5.3 These two areas are situated near Starling Inlet, NENT (Figure 1). The study area of So Lo Pun (approximate 26 ha) is greater than Yung Shue Au (16.5 ha). Both areas fall outside Plover Cove Country Park boundary. Currently, there is no vehicular access to these two areas. The following table summarizes the habitats covered by each taxa group.

Table 4. Habitats surveyed by each taxa group, and the survey dates for So Lo Pun and Yung Shue Au

	Secondary forest	Feng shui woods	Abandoned farmlands	Lowland stream	Mangrove and freshwater marsh	Survey date(s) in 2003
Plants	+	+	+	+		7 Aug
Infrared camera exercise	+	+				9-22 Dec
Birds	+	+	+	+	+	7 Aug and 20 Nov

2. METHODOLOGY

Plants

2.1 Field surveys were carried out for two days in both the wet and dry seasons. Representative natural or semi natural habitats at Lin Ma Hang, Kuk Po and So Lo Pun were surveyed. Sites where surveys were undertaken were marked on countryside series maps published by the Lands and Mapping Office, the Hong Kong Special Adminstrative Region Government. The type of vegetation, height of vegetation, and dominant species were noted. All vascular plant species encountered were recorded and a checklist of plants with relative abundance was made for each surveyed site. Unidentified species were collected for further study. Status of the plants follows Hong Kong Vascular Plants: Distribution and Status (Corlett *et al*. 2000).

Infrared camera traping for medium to large mammals

2.2 Auto-trigger camera traps sensitive to heat and motion were utilized to obtain a photographic record of mammal activity in the study areas. Camera traps were tree mounted at heights of 1-2.5 m in areas showing clear signs of mammal activity. Traps were placed throughout the entire survey area ensuring no two cameras were closer than 200 meters apart in order to reduce the likely hood of dual records. Because of limitations in equipment design, no placement could be made in un-shaded or open ground. Each camera was loaded with Kodak 400ASA film upon installation and set to imprint the event date on each photograph taken. A GPS co-ordinate and map location was recorded at each installation site or from the closest available signal when the installation site failed to receive any signals. Cameras were unbaited and assumed undisturbed by human activity until return for removal and film processing 12-15 days after installation. Two models of camera trap were utilized during this study, the USA made Moultrie Gamecam II and the Taiwan made Wildlife Conservation Foundations Wildcam II. Nomenclature follows Corbet and Hill (1992), while the level of conservation concern follows Fellowes *et al.* (2002).

Bats were surveyed at the roost site, by visual means using torchlight for identification and number counts. Specimens were also caught using a hand net for identification and some digital photographic records taken.

Birds

2.3 Field surveys covered both wet and dry seasons. Important bird habitats including forest were surveyed on foot with binoculars. All observations commenced between 08:00 and 10:00 h. Bird species seen or heard were identified and counted. The level of conservation concern follows Fellowes *et al.* (2002), while the protection status in China follows Wang (1998).

Amphibians and Reptiles

2.4 Amphibians were recorded by active searching, auditory detection of mating calls and dip-netting for tadpoles. Reptiles were recorded by active searching in suitable micro-habitats. The level of conservation concern of amphibians and reptiles in Hong Kong follows Fellowes *et al.* (2002).

Freshwater Fish

2.5 Field surveys were carried out over two days in the wet season. Representative lotic and lentic habitats at Lin Ma Hang and San Kwai Tin were surveyed. Survey sites were marked on maps of the area. Abiotic and biotic characteristics of the sampling sites were noted. All fish species encountered were recorded and a checklist with relative abundance was made for each sampling site. Unidentified species were collected for further study. The level of conservation concern follows Fellowes *et al.* (2002).

Butterflies and Dragonflies

2.6 Wetland habitats were paid special attention for the dragonfly survey. For dragonflies, wetland habitats were particularly targeted. Dragonflies and butterflies were observed and identified with the aid of binoculars. For species requiring closer examination, an extendable insect net was used to catch them. These were subsequently released back to the same site following identification. Unidentified species were collected for further study. Butterfly nomenclature and sequence follows Bascombe *et al.* (1999). The level of conservation concern of butterflies and dragonflies follows Fellowes *et al.* (2002).

Moths

2.7 Light trapping using a Robinson trap fitted with a 125W MB-F mercury vapour (MV) light (following Fry & Waring, 1996) was undertaken at San Kwai Tin. The trap was placed in representative tall shrub habitat, with sheltered aspect, near the bottom of the valley and inspected at regular intervals through the evening, both to monitor for any interruptions to trap operation and to inspect foliage in the immediate vicinity of the trap for newly arrived moths that did not fly directly into the trap. Abundance counts of each species present took place prior to closing down the trap Species were identified by comparison with material from the collection of R. C. Kendrick housed at Kadoorie Farm & Botanic Garden and illustrated in Kendrick (2002). Nomenclature follows Kendrick (2002). The level of conservation concern of moths in Hong Kong follows Fellowes *et al.* (2002).

3. RESULTS AND DISCUSSION

Lin Ma Hang

Vegetation

3.1.1 The Lin Ma Hang area is surrounded by hillsides covered in secondary forest (Plate 1, 2 and 3). The low-lying area of Lin Ma Hang is mainly flat abandoned farmland that has largely become grassland and patches of shrubland. There are also several villages with *feng-shui* woodland nearby.

3.1.2 Secondary forest on the hillsides is largely dominated by *Schima superba*, *Cinnamomum camphora*, *Schefflera heptaphylla*, *Aquilaria sinensis*, and *Ardisia quinquegona* (Plate 2). The forest is about 6-15m tall with trees up to 30 cm dbh. The size and composition of the forest suggested that it has recently regenerated in the last 30-40 years.

3.1.3 *Feng shui* woods behind the villages are dominated by *Cinnamomum camphora*, *Schima superba*, *Celtis tetrandra* ssp. *sinensis*, *Aquilaria sinensis*, *Syzygium levinei*, and *Aporosa dioica* (Plate 1). The forest is about 10-20m tall with trees up to 80cm dbh. Despite the size of trees, the composition suggested the forest was moderately disturbed.

3.1.4 Abandoned farmland and shrubland are dominated by grass and shrubs, including *Imperata koenigii*, *Microstegium ciliatum*, *Cyclosorus interruptus*, and *Melastoma candidum*, with scattered saplings and small trees commonly found in the surrounding hillside secondary forest.

Flora

3.2.1 A total of 217 plant species was recorded on 10 July 2003. Of these 217 species, four of them are of conservation concern. These four species are

3.2.2 *Brainea insignis:* A restricted fern in Hong Kong (Wu and Lee 2000). Also protected in China (II). It is locally common at the *feng shui* wood behind the Old House.

3.2.3 *Alsophila spinulosa:* A restricted fern in Hong Kong (Wu and Lee 2000). Protected in China (II) and Hong Kong. Five plants were found in the hillside secondary forest.

3.2.4 *Gymnosphaera metteniana*: A very rare fern. Protected in China (II) and Hong Kong. The species has previously not been recorded from Hong Kong. Only a single plant was found in the present survey in the hillside secondary forest.

3.2.5 *Gymnosphaera podophylla*: A restricted fern in Hong Kong (Wu and Lee 2000). Protected in China (II) and Hong Kong. Three plants were found in the hillside secondary forest.

3.2.6 *Aquilaria sinensis*: A common species in Hong Kong (Corlett *et al*. 2000). Protected in China (II) and considered globally Vulnerable (IUCN 2003). It is endangered in China due to its collection for production of the incense "chenxiang". It is locally common in the *feng-shui* wood behind the Lin Ma Hang village and the hillside secondary forest.

3.2.7 These four species, except *Brainea insignis* at the old house *feng shui* wood, were recorded in the secondary forest. The highest plant diversity was found in the abandoned farmland, while the lowest was found in the village. The plant diversity of the two *feng shui* woods was similar.

3.2.8 In regard to the orchid, about 32 individuals of *Goodyera viridiflora* were recorded at the secondary forest near Tong To Shan Tsuen on 10 July 2003. This species is a terrestrial orchid and is regarded as "Restricted" by (Siu 2000).

Mammals

3.3.1 The camera trapping and casual observations made in July 2003 revealed a minimum of five large mammal species (excluding feral dogs) present at Lin Ma Hang.

3.3.2 Seven infrared cameras were installed in sites showing signs of mammal activity between 10 and 28 July 2003 (Figure 2). A total of five mammal species and 31 mammal records were made (Table 5). In addition, two photographs of feral dogs were also taken by cameras. The frequency of occurrence of the Malayan Porcupine (*Hystrix brachyura*) was the highest, while the Wild Boar (*Sus scrofa*) and Chinese Ferret Badger (*Melogale moschata*) were the lowest. Although the wild mammals recorded are widespread in the New Territories, the Malayan Porcupine is regarded as of "Potential Global Concern", while the Indian Muntjac is of "Potential Regional Concern" (Fellowes *et al.* 2002) (Plate 4).

3.3.3 Apart from the mammals recorded by the infrared camera trapping exercise, burrows of the Chinese Pangolin (*Manis pentadactyla*), and faeces and vocalizations of roosting bats were noted in an abandoned building during camera installation in July. These indicate that the Chinese Pangolin and insectivorous bats are present in Lin Ma Hang. The Chinese Pangolin is considered to be a rare mammal in Hong Kong with restricted distribution (Shek 2003). It is also considered to be of "Regional Concern" (Fellowes *et al.*, 2002).

Table 5. Native mammal and bird species recorded by seven infrared camera traps at Lin Ma Hang between 10 and 28 July 2003.

Common name	Scientific name	Conservation Status	Records
Mammals			
1. Wild Boar	*Sus scrofa*		1
2. Indian Muntjac	*Muntiacus muntjak*	Potential Regional Concern	10
3. Malayan Porcupine	*Hystrix brachyura*	Potential Global Concern	13
4. Small Indian Civet	*Viverra indica*		5
5. Chinese Ferret Badger	*Melogale moschata*		1
Sub-total			*31*
Birds			
1. Lesser Coucal	*Centropus bengalensis*		1
2. Magpie Robin	*Copsychus saularis*		4
3. Orange-headed Thrush	*Zoothera citrinus*	Local Concern	6
4. Black-faced Laughing Thrush	*Garrulax perspicillatus*		1
5. Greater Necklaced Laughing Thrush	*Garrulax pectoralis*		1
Sub-total			*13*
Total photo records			**46**

Bats

3.3.4 Bats were seen during a visit to Lin Ma Hang Mine on 28 November 2003 covering the two major entrances to the mine, one on the upper hillside and the other lower and above police tower 28 along the FCA border road.

3.3.5 In the upper tunnel approximately 200 Rousette Fruit Bats (*Rousettus leschenaulti*) and one Least Horseshoe Bat (*Rhinolophus pusillus*) were recorded. The conservation status of the Least Horseshoe Bat is regarded as "Potential Regional Concern", while it is "Local Concern" for the

Rousette Fruit Bats (Fellowes *et al.* 2002). The Rousette Fruit Bats has been found at less than 10 roosts in Hong Kong and previous largest roost situated in Tai Lam Country Park had numbers seriously reduced apparently due to loss of feeding habitat in the Kam Tin valley. Therefore the Lin Ma Hang population is of local conservation importance.

3.3.6 In the lower tunnel approx 800-1000 Large bent-winged bats (*Miniopterus magnater*) (Plate 6), 10 Rickett's big-footed bats (*Myotis ricketti*) and one Large mouse-eared bat (*Myotis chinensis*) were recorded. This tunnel represents the most important over-wintering roost for the bent winged bat in Hong Kong. Numbers could be over 2000 individuals in January and February in each year. The conservation status of Large Bent-winged Bats is regarded as "Potential Regional Concern", while it is "Local Concern" for Rickett's Big-footed Bats and Large Mouse-eared Bat (Fellowes *et al.* 2002). Also, the large mouse-eared bat is one of the rarest bats in Hong Kong having been recorded from less than 10 sites, bats numbering less than five individuals per site.

Birds

3.4.1 A total of 48 bird species were recorded in the visual surveys and camera trapping (Table 5 and 6).

3.4.2 In the summer survey on 10 July 2003, 26 species were recorded (Table 6). The Japanese White-eye (*Zosterops japonicus*) was the dominant species. Although most of the species are common and widespread in Hong Kong, the Chinese Pond Heron (*Ardeola bacchus*) is regarded as of "Potential Regional Concern" (Fellowes *et al.*, 2002), while the Greater Coucal (*Centropus sinensis*) and Lesser Coucals (*Centropus bengalensis*) are Class II China National Protected Species. In addition, the record of the forest dependent Black-throated Laughing Thrush (*Garrulax chinensis*) is of interest as its distribution is restricted to Hong Kong Island and Central New Territories including Tai Po Kau and Shing Mun (Carey *et al.* 2001).

3.4.3 During the winter survey on 13 Nov 2003, 34 species were recorded (Table 6). The Red-whiskered Bulbul was the dominant species. Although most of the species are common and widespread, the Grey Bushchat (*Saxicola ferrea*) is regarded as of "Local Concern" (Fellowes *et al.* 2002). Also, the Crested Serpent Eagle and Crested Goshawk (*Accipiter trivirgatus*) are Class II China National Protected Species. The presence of forest species including the Chestnut Bulbul (*Hypsipetes castanonotus*), Greater Necklaced Laughing Thrush (*Garrulax pectoralis*), Black-throated Laughing Thrush and Asian Stubtail (*Urosphena squameiceps*), indicates that the secondary forest is of conservation importance particularly to the understorey birds.

3.4.4 Apart from the two surveys, the forest dependent Orange-headed Thrush (*Zoothera citrinus*) (Plate 5), a species of "Local Concern", was recorded by the camera trap in July 2003 (Table 5). It is regarded as a scare winter visitor and passage migrant with occasional summer records and has probably bred (Carey *et al.* 2001). The summer record at Lin Ma Hang may indicate that it is a resident or summer visitor there. Apart from Tai Po Kau, Lin Ma Hang is the other known summer location for this species in Hong Kong.

Table 6. List of birds recorded at Lin Ma Hang on 10 July and 13 November 2003.

Common name	Scientific name	Conservation Concern	10 Jul	13 Nov
1. Chinese Pond Heron	*Ardeola bacchus*	Potential Regional Concern	2	
2. Crested Serpent Eagle	*Spilornis cheela*	Class II China National Protected Species		2

Common name	Scientific name	Conservation Concern	10 Jul	13 Nov
3. Crested Goshawk	*Accipiter trivirgatus*	Class II China National Protected Species		1
4. Chinese Francolin	*Francolinus pintadeanus*		1	
5. White-breasted Waterhen	*Amaurornis phoenicurus*		5	
6. Spotted Dove	*Streptopelia chinensis*		13	3
7. Plaintive Cuckoo	*Cacomantis merulinus*		1	
8. Common Koel	*Eudynamys scolopacea*		2	
9. Greater Coucal	*Centropus sinensis*	Class II China National Protected Species	5	
10. Lesser Coucal	*Centropus bengalensis*	Class II China National Protected Species	2	
11. Little Swift	*Apus affinis*		15	
12. Barn Swallow	*Hirundo rustica*		10	
13. White Wagtail	*Motacilla alba*			1
14. Olive-backed Pipit	*Anthus hodgsoni*			2
15. Red-whiskered Bulbul	*Pycnonotus jocosus*		35	18
16. Chinese Bulbul	*Pycnonotus sinensis*		15	4
17. Sooty-headed Bulbul	*Pycnonotus aurigaster*		12	
18. Chestnut Bulbul	*Hypsipetes castanonotus*			5
19. Long-tailed Shrike	*Lanius schach*		6	1
20. Siberian Rubythroat	*Luscinia calliope*			3
21. Red-flanked Bluetail	*Tarsiger cyanurus*			1
22. Oriental Magpie Robin	*Copsychus saularis*		10	1
23. Grey Bushchat	*Saxicola ferrea*	Local Concern		1
24. Blue Whistling Thrush	*Myiophoneus caeruleus*			1
25. Common Blackbird	*Turdus merula*			7
26. Grey-backed Thrush	*Turdus hortulorum*			3
27. Orange headed Thrush*	*Zoothera citrinus*	Local Concern		
28. Masked Laughing Thrush	*Garrulax perspicillatus*		13	3
29. Greater Necklaced Laughing Thrush	*Garrulax pectoralis*			5
30. Black-throated Laughing Thrush	*Garrulax chinensis*		1	5
31. Hwamei	*Garrulax canorus*		3	1
32. Striated Yuhina	*Yuhina castaniceps*			8
33. Asian Stubtail	*Urosphena squameiceps*			2
34. Yellow-bellied Prinia	*Prinia flaviventris*			3
35. Plain Prinia	*Prinia inornata*			1
36. Common Tailorbird	*Orthotomus sutorius*		18	6
37. Dusky Warbler	*Phylloscopus fuscatus*			1
38. Yellow-browed Warbler	*Phylloscopus inornatus*			2
39. Great Tit	*Parus major*		6	5
40. Flowerpecker	*Dicaeum sp.*			1
41. Fork-tailed Sunbird	*Aethopyga christinae*		2	1
42. Japanese White-eye	*Zosterops japonicus*		39	9
43. Scaly-breasted Munia	*Lonchura punctulata*			8
44. Eurasian Tree Sparrow	*Passer montanus*		12	6
45. Black-collared Starling	*Sturnus nigricollis*		6	
46. Black Drongo	*Dicrurus macrocercus*		4	
47. Blue Magpie	*Urocissa erythrorhyncha*		7	

Common name	Scientific name	Conservation Concern	10 Jul	13 Nov
48. Large-billed Crow	*Corvus macrorhynchus*			1
Total no of species recorded in each survey			**26**	**34**

* one individual was recorded by infrared camera exercise in July 2003

Amphibians and Reptiles

3.5.1 A total of three amphibian and two reptile species were recorded in July 2003 (Table 7).

Table 7. List of amphibian and reptile species found on 10 July 2003 and their rank of abundance at Lin Ma Hang (+ = 1-2, +++ = 6-10, ++++ = 11-20, +++++ = over 20)

Common Name	Scientific Name	Habitat	Rank of abundance
Reptiles			
1. Changeable Lizard	*Calotes versicolor*	Grassland	+
2. Chinese Waterside Skink	*Tropidophorus sinicus*	Stream bank	+
Amphibians			
1. Asian Common Toad	*Bufo melanostictus*	i. Riparian forest	+
		ii. Forest	+
2. Gunther's Frog	*Rana guentheri*	Stream	+++
3. Spotted Narrow-mouthed Frog	*Kalophrynus interlineatus*	Marsh	+++++ (calling)

3.5.2 The Spotted Narrow-mouthed Frog (*Kalophrynus interlineatus*), which was found in the marsh, was the most frequently encountered amphibian. This frog is fairly widely distributed in central and northern New Territories (Lau and Dudgeon 1999). All other amphibians and reptiles recorded are widespread locally (Karsen *et al.* 1998). The Red-necked Keelback, *Rhabdophis submniatus*, was recorded from Lin Ma Hang previously (M. Lau, unpublished data). This species is also fairly widespread in Hong Kong (Karsen *et al.* 1998).

Freshwater fish

3.6.1 A total of 13 freshwater fish were recorded during the survey on 10 July 2003 (Table 8). Fish diversity and abundance was high - *Rasbora steineri*, *Parazacco spilurus*, *Nicholsicypris normalis*, *Puntius semifasciolatus* and *Rhinogobius duospilus* are the dominant species. Two species recorded - *Rasbora steineri* and *Mastacembelus armatus* are extremely rare and restricted in Hong Kong. These two species are regarded as of "Global Concern" and "Local Concern", respectively (Fellowes *et al.* 2002).

Table 8. List of freshwater fish species found and their rank of abundance at Lin Ma Hang on 10 July 2003, between 15.00-18.00 (+ = rare, ++ = common, +++ = abundant).

Species	Conservation concern	Habitat	Rank of abundance
1. *Rasbora steineri*	Global Concern	Stream	+++
2. *Parazacco spilurus*		Stream	+++
3. *Nicholsicypris normalis*		Stream	+++
4. *Hemiculter leucisculus*		Village pond only	++
5. *Puntius semifasciolatus*		Stream	+++
6. *Carassius auratus*		Stream, above village only	++

Species	Conservation concern	Habitat	Rank of abundance
7. *Rasbora steineri*	Global Concern	Stream	+++
8. *Parazacco spilurus*		Stream	+++
9. *Nicholsicypris normalis*		Stream	+++
10. *Hemiculter leucisculus*		Village pond only	++
11. *Puntius semifasciolatus*		Stream	+++
12. *Carassius auratus*		Stream, above village only	++
13. *Misgurnus anguillicaudatus*		Stream	++
14. *Clarias fuscus*		Stream, above village only	++
15. *Mastacembelus armatus*	Local Concern	Stream	+
16. *Gambusia "affinis"*		Stream, below village only	+++
17. *Oreochromis* sp.		Village pond only	+++
18. *Rhinogobius duospilus*		Stream	+++
19. *Macropodus opercularis*		i. Marsh	++
		ii. Stream	+

3.6.2 Apart from the rare species and high diversity, the presence of fish of different trophic levels, e.g. the predatory fish, indicates that the fish community in the Lin Ma Hang stream is healthy and intact. Unspoiled, meandering lowland stream like Lin Ma Hang is very rare in Hong Kong due to water pollution and habitat loss, most notably by channelization, making Lin Ma Hang arguably the most important lowland site for stream fish conservation in Hong Kong (Plate 3).

3.6.3 The freshwater fish community at Lin Ma Hang was first described by Chan (2001) in a territorial wide freshwater fish study at HKU. In considering the high ecological value of the lowland stream at Lin Ma Hang, a SSSI proposal was submitted to the Town Planning Board in 1999 and it is still being considered. Our surveys reinforced the findings of Chan (2001) that the stream is of the highest local conservation value and the fish community has remained stable.

Butterflies and Dragonflies

3.7 A total of 30 butterfly species and 12 dragonfly species was recorded on 10 July 2003 (Table 9 and 10). Most of the butterfly species were recorded on the forest edge and *feng shui* woods. *Graphium cloanthus* and *Eurema brigitta* are regarded as of "Local Concern" (Fellowes *et al.* 2002). Eight of the dragonfly species were found along streams. *Idionyx victor* is a species of "Local Concern" (Fellowes *et al.* 2002). The rest of the dragonflies are common and widespread in Hong Kong (Wilson *et al.* 2003).

Table 9. List of butterfly species found on 10 July 2003 and their rank of abundance at Lin Ma Hang (+ = 1-2, ++ = 3-5, +++ = 6-10).

Common Name	Scientific name	Habitat	Rank of abundance
1. Bush Hopper	*Ampittia dioscorides*	Stream habitat / grassland	++
2. Grass Demon	*Udaspes folus*	Forest edge	+
3. Bamboo Straight Swift	*Parnara ganga*	Grassland	+
4. Contiguous Swift	*Polytremis lubricans*	Forest edge	+
5. Common Bluebottle	*Graphium sarpedon*	Forest edge	+
6. Glassy bluebottle	*Graphium cloanthus*	Village / stream habitat	+
7. Tailed Green Jay	*Graphium agamemnon*	Village / stream habitat	+
8. Common Mime	*Papilio clytia*	Forest edge	+
9. Common Mormon	*Papilio polytes*	Village /shrubland	+++
10. Great Mormon	*Papilio memnon*	*Feng Shui* Wood / Forest edge	+

Common Name	Scientific name	Habitat	Rank of abundance
11. Red-base Jezebal	*Delias pasithoe*	Forest edge	+
12. Common White	*Pieris canidia*	Grassland	+
13. Small Grass Yellow	*Eurema brigitta*	Forest edge	+
14. Common Grass Yellow	*Eurema hecabe*	Forest edge / grassland	++
15. Green Flash	*Artipe eryx*	Shrubland	+
16. Chocolate Royal	*Remelana jangala*	Forest edge	+
17. Lesser Grass Blue	*Zizina otis*	Village	+++
18. Quaker	*Neopithecops zalmora*	*Feng Shui* Wood	++
19. Glassy Tiger	*Parantica aglea*	Village	+++
20. Ceylon Blue Glassy Tiger	*Ideopsis similis*	Village / stream habitat/shrubland	+++
21. Common Crow	*Euploea core*	Village	+++
22. Blue Spotted Crow	*Euploea midamus*	*Feng Shui* Wood	+
23. Common Evening Brown	*Melanitis leda*	*Feng Shui* Wood / Forest	++
24. Common White-banded Brown	*Lethe confusa*	Shrubland	+
25. Dark-brand Bush Brown	*Mycalesis mineus*	Forest edge	+++
26. Common Six Wing	*Ypthima baldus*	*Feng Shui* Wood / grassland	++
27. Common Sergeant	*Athyma perius*	Forest edge	+
28. Common Jester	*Symbrenthia lilaea*	Forest edge	+
29. Gaudy Baron	*Euthalia lubentina*	Village	+
30. Peacock Pansy	*Junonia almana*	Forest edge / grassland	+

Table 10. List of Dragonfly species found on 10 July 2003 and their rank of abundance at Lin Ma Hang (+ = 1-2, ++ = 3-5, +++ = 6-10, ++++ = 11-20, +++++ = over 20).

Scientific name	Habitat	Rank of abundance
1. *Rhinocypha perforata*	Stream	+++
2. *Euphaea decorata*	Stream	++++
3. *Ceriagrion auranticum*	Stream	++
4. *Copera ciliata*	Stream	++
5. *Copera marginipes*	Stream	++++
6. *Prodasineura autumnalis*	Stream	++++
7. *Idionyx victor*	Stream	+
8. *Lyriothemis elegantissima*	Forest	+
9. *Orthetrum luzonicum*	Marsh	++
10. *Trithemis aurora*	Stream	+++
11. *Rhyothemis variegata*	Marsh	+
12. *Pantala flavescens*	Grassland	+++++

San Kwan Tin

Vegetation

3.8 No visit was made to San Kwan Tin during the present survey because of time constraints. However, earlier surveys in 1999 and December 2003 (S. C. Ng, pers. comm.) recorded extensive cover of secondary forest dominated by *Schefflera heptaphylla*, *Syzygium hancei*, *Machilus breviflora*, *Sterculia lanceolata*, *Ilex viridus*, and *Ardisia quinquegona* (Plate 7). Canopy of the forest ranged from 6 to 15m tall. The forest has probably regenerated for the last 30-40 years.

Flora

3.9.1 Earlier surveys in December 2003 (S. C. Ng, pers. comm.) had found three species of conservation interest, they were:

3.9.2 *Aquilaria sinensis*: A common species in Hong Kong (Corlett *et al*. 2000). Protected in China (II) and considered globally Vulnerable (IUCN 2003). It is being endangered in China due to the collection of its decayed woods for production of the incense "chenxiang". It is locally common in the forest.

3.9.3 *Toona rubriflora*: A restricted species in Hong Kong. Previously this species is not known from Hong Kong, and has only been recorded from Fujian. About five trees were found in the forest at about 200m.

3.9.4 *Acacia pennata*: A rare species in Hong Kong (Corlett *et al*. 2000). A large colony with vine up to 20cm diameter was found in the forest.

Freshwater fish

3.10 A total of seven freshwater fish were recorded in the survey on 10 July 2003 (Table 11). Frequently encountered species were *Parazacco spilurus*, *Liniparhomaloptera disparis disparis* and *Rhinogobius duospilus*. All species are widespread in Hong Kong except *Nicholsicypris normalis*, which has a restricted distribution in Hong Kong.

Table 11. List of fish species found on 10 July 2000, and their rank of abundance at San Kwai Tin (+ = rare, ++ = common, +++ = abundant).

Species		Rank of abundance
1.	*Parazacco spilurus*	+++
2.	*Nicholsicypris normalis*	+++
3.	*Liniparhomaloptera disparis disparis*	+++
4.	*Misgurnus anguillicaudatus*	++
5.	*Monopterus albus*	+
6.	*Silurus cochinchinensis*	++
7.	*Rhinogobius duospilus*	+++

Amphibians and reptiles

3.11 A total of four amphibian and five reptile species were recorded in the survey on 10 July 2003 (Table 12). The most frequently encountered amphibian and reptile were the Spotted Narrow-mouthed Frog (*Kalophrynus interlineatu*s) and Bicoloured Stream Snake (*Opisthotropis lateralisand*). The Anderson's Stream Snake (*Opisthotropis andersonii*) is of "Potential Global Concern" (Fellowes *et al.* 2002) (Plate 8). The Mountain Wolf Snake (*Lycodon ruhstrati*) and Diamond-backed Water

Snake (*Sinonatrix aequifasciata*) are of "Local Concern" (Fellowes *et al.* 2002). The remaining species are widespread in Hong Kong (Karsen *et al.* 1998).

Table 12. List of reptile and amphibian species found on 10 July 2003 and their rank of abundance at San Kwai Tin (+ = 1-2, ++ = 3-5, +++ = 6-10).

Common Name	Scientific Name	Habitat	Rank of abundance
Reptiles			
1. Chinese Waterside Skink	*Tropidophorus sinicus*	Stream	+
2. Mountain Wolf Snake	*Lycodon ruhstrati*	Riparian Forest	+
3. Anderson's Stream Snake	*Opisthotropis andersoni*	Stream	+
4. Bicoloured Stream Snake	*Opisthotropis lateralis*	Stream	+++
5. Diamond-backed Water Snake	*Sinonatrix aequifasciata*	Stream	++
Amphibians			
1. Asian Common Toad	*Bufo melanostictus*	Riparian forest	++
		Stream	++
2. Gunther's Frog	*Rana guentheri*	Stream	++
3. Green Cascade Frog	*Rana livida*	Stream	+
4. Spotted Narrow-mouthed Frog	*Kalophrynus interlineatus*	Marsh	+++ (calling)

Moths

3.12 A total of 25 moth species were recorded on 10 July 2003 (Table 13). *Luceria striata*, *Ugia purpurea* (Plate 9), and *Cerynea discontenta* are endemic to Hong Kong. Only one individual of each species, except two of the "Local Concern" *Luceria striata*, was recorded.

Table 13. List of moths recorded by light traps at San Kwai Tin between 19:10 and 21:15h on 10 July 2003.

Scientific Name	Scientific Name	Scientific Name
Oecophoridae: Stathmopodinae	Geometridae: Ennominae	18. *Maguda suffusa*
1.*Hieromantis* sp. nr. *ephodophora*	9. *Peratophyga venetia*	19. *Ugia purpurea*
Cosmopterigidae	10. *Hyposidra talaca*	Noctuidae: Acontiinae
2. *Labdia oxychlora*	Eupterotidae	20. *Cerynea discontenta*
Tortricidae	11. *Apha* sp. A / nov	21. *Corgatha ruficeps*
3. *Neocalyptis affinisana*	Noctuidae: Herminiinae	22. *Oruza divisa*
4. *Ophiorrhabda mormopa*	12. *Bertula abjudicalis*	Arctiidae: Lithosiinae
5. *Cryptophlebia repletana*	Noctuidae: Strepsimanninae	23. *Eilema fuscodorsalis*
Crambidae: Odontiinae	13. *Luceria striata*	24. *Microlithosia shaowuica*
6. *Heortia vitessoides*	14. *Schrankia costaestrigalis*	Arctiidae: Arctiinae
Crambidae: Pyraustinae	Noctuidae: Catocalinae	25. *Creatonotos transiens*
7. *Herpetogramma* sp. B	15. *Dysgonia crameri*	
Geometridae: Geometrinae	16. *Dysgonia fulvotaenia*	
8. *Pingasa ruginaria*	17. *Blasticorhinus enervis*	

Dragonflies

3.13 Only *Euthaea decorata* and *Gynacantha subinterrupta* were recorded near the stream on 10 July 2003 as this site was only covered at dusk and in the evening. Locally *G. subinterrupta* was previously recorded at only four sites (Wilson *et al.* 2003) and is considered to be of "Local Concern" (Fellowes *et al.* 2002).

Kuk Po

Vegetation

3.14.1 The vegetation of Kuk Po comprised of a mosaic of *feng shui* woodland, secondary forest, shrubland, abandoned farmland, marshes, village and mangrove (Plate 10).

3.14.2 Abandoned farmland is grassland habitat formed from abandoned paddy and is now maintained by grazing from feral cattle. Marsh is waterlogged grassy wetland formed from abandoned paddy.

3.14.3 Mangrove was found at the seaward margin of Kuk Po. It is dominated by *Kandelia candel*, *Hibiscus tiliaceus*, and *Cyperus malaccensis* var. *brevifolius*. Height of the vegetation is about 1-2m. A reed bed of *Phragmites australis* was found at the backward of the mangrove. Height of the reed is about 1.5 –2.5m.

3.14.4 *Feng shui* woodlands were largely dominated by *Endospermum chinense*, *Elaeocarpus dubius*, *Machilus pauhoi*, *Sterculia lanceolata*, *Osmanthus matsumuranus* and *Ardisia quinquegona*. Height of the forest ranged from 10m to 25m. These dominant species are typical of relatively well-preserved lowland forest in South China.

Flora

3.15.1 In Kuk Po, 218 plant species were recorded on 19 June 2003 (Appendix 2A). Of these 218 species, nine of them are of conservation concern (Appendix 2B). These species are

3.15.2 *Popowia pisocarpa*: A rare tree restricted to *feng shui* woods (Corlett *et al*. 2000). Mainly found in the Lam Tsuen Valley. It is the first locality outside Lam Tsuen.

3.15.3 *Ilex chapaensis:* A very rare tree restricted to lowland forest (Corlett *et al*. 2000). Also recorded at Ma On Shan and Sunset Peak

3.15.4 *Crateva trifoliate:* A rare tree restricted to streamsides and lowland forest (Corlett *et al*. 2000). Also recorded at Pat Sin Leng, Sheung Wo Hang, Tai Om and Ng Tung Chai.

3.15.5 *Acacia pennata*: A rare woody climber (Corlett *et al*. 2000). Also recorded at San Kwai Tin, Robin's Nest, Kei Ling Ha, Ho Chung and Ma On Shan.

3.15.6 *Entada phaseoloides:* A very rare woody climber restricted to the lowland forest (Corlett *et al*. 2000). Also recorded at Hoi Ha and Tai Po Kau.

3.15.7 *Artocarpus tonkinensis:* A rare tree restricted to lowland forest (Corlett *et al*. 2000). Also recorded at Shing Mun, Tai Om, She Shan, Lam Tsuen, Pik Uk and Lai Chi Wo.

3.15.8 *Mucuna championii*: A rare endemic woody climber restricted to lowland forest (Corlett *et al*. 2000). Recorded at Kuk Po previously. Other locations are Fung Yuen and She Shan. It is locally common along the stream flowing from San Uk to the sea.

3.15.9 *Ailanthus fordii*: A restricted protected tree. Also recorded at Por Kai Shan, Ma On Shan, Cheung Sha, Tai Om and Lai Chi Wo.

3.15.10 *Aquilaria sinensis*: Although it is common in lowland forest and *feng shui* wood in Hong Kong (Xing *et al*. 2000), it is a Category II nationally protected species in China and is listed as globally Vulnerable.

3.15.11 Most of these rare species were recorded in the *feng shui* woods at Lo Wai, San Uk and Ng To (Appendix 3). The highest plant diversity is found at the Lo Wai *feng shui* wood, while the abandoned farmland is the lowest.

3.15.12 In an evaluation study of terrestrial ecological hotspots by Chu (1998), the San Uk Ha *feng shui* wood at Kuk Po is proposed to be a "Conservation Area" due to the presence of at least six rare plants including *Ailanthus fordii* and *Aidia pycnantha*.

Mammals

3.16.1 Seven infrared camera traps were installed in sites showing signs of mammal activity between 1 and 15 August 2003 (Figure 3). A total of four native mammal and four bird species were recorded (Table 14). In addition, 24 photos of domestic cow (*Bos Taurus*) were also taken by the cameras. The frequency of occurrence of the Wild Boar was the highest (Plate 11), while the Small Indian Civet (*Viverra indica*) was the lowest. Although the recorded mammal species are widespread in the New Territories, the Malayan Porcupine is regarded as of "Potential Global Concern" (Fellowes *et al.* 2002).

3.16.2 Apart from the photo records, about 10 civet scats were found on a grave site near Lo Wai. This indirect evidence indicates that civets are quite active in this area of Kuk Po.

Table 14. Native mammal and bird species recorded by infrared camera traps at seven locations in Kuk Po between 1 and 15 August 2003.

Common name	Scientific name	Conservation Concern	Records
Mammals			
1. Wild boar	*Sus scrofa*		59
2. Malayan Porcupine	*Hystrix brachyura*	Potential Global Concern	18
3. Small Indian Civet	*Viverra indica*		1
4. Chestnut Spiny Rat	*Nivienter fulvescens*		6
Sub-total			*84*
Birds			
1. Cattle Egret	*Bubulcus ibis*		10
2. Lesser Coucal	*Cenoptris bengalensis*		4
3. Magpie Robin	*Copsychus saularis*		3
4. Masked Laughing Thrush	*Garralux perspicillatus*		7
Sub-total			*24*
Total photo records			**132**

Birds

3.17.1 A total of 43 bird species were recorded during the bird survey and camera trapping (Table 14 and 15). In the survey on 6 November 2003, 42 bird species were recorded (Table 15). The Red-whiskered Bulbul (*Pycnonotus jocosus*) and Chinese Bulbul (*Pycnonotus sinensis*) were the dominant species. Most of the recorded birds are common and widespread. Notable species are: Intermediate Egret (*Egretta intermedia*) of "Regional Concern", Zitting Cisticola (*Cisticola juncidis*) of "Local

Concern", Grey Treepie (*Dendrocitta formosae*) of "Local Concern", and Red-billed Starling (*Sturnus sericeus*) of "Global Concern"(Fellowes *et al.* 2002).

3.17.2 The presence of the Chestnut Bulbul and the Grey Treepie could indicate that the secondary forest at Kuk Po is mature enough for these forest dependent birds.

Table 15. List of birds recorded at Kuk Po on 6 November 2003.

Common name	Scientific name	Conservation Concern	No. of birds
1. Grey Heron	*Ardea cinerea*	Potential Regional Concern	1
2. Great Egret	*Egretta alba*	Potential Regional Concern	12
3. Intermediate Egret	*Egretta intermedia*	Regional Concern	1
4. Little Egret	*Egretta garzetta*	Potential Regional Concern	3
5. Chinese Pond Heron	*Ardeola bacchus*	Potential Regional Concern	1
6. Black-crowned Night Heron	*Nycticorax nycticorax*		2
7. Crested Serpent Eagle	*Spilornis cheela*	Class II China National Protected Species	2
8. Common Buzzard	*Buteo buteo*		2
9. Common Sandpiper	*Actitis hypoleucos*		1
10. Spotted Dove	*Streptopelia chinensis*		20
11. Pied Kingfisher	*Ceryle rudis*		3
12. White-throated Kingfisher	*Halcyon smyrnensis*		3
13. Black-capped Kingfisher	*Halcyon pileata*		1
14. Grey Wagtail	*Motacilla cinerea*		2
15. White Wagtail	*Motacilla alba*		2
16. Olive-backed Pipit	*Anthus hodgsoni*		3
17. Red-whiskered Bulbul	*Pycnonotus jocosus*		>50
18. Chinese Bulbul	*Pycnonotus sinensis*		>50
Bulbuls	*Pycnonotous sp.*		100
19. Chestnut Bulbul	*Hypsipetes castanonotus*		3
20. Brown Shrike	*Lanius cristatus*		1
21. Long-tailed Shrike	*Lanius schach*		2
22. Siberian Rubythroat	*Luscinia calliope*		3
23. Oriental Magpie Robin	*Copsychus saularis*		2
24. Common Stonechat	*Saxicola torquata*		2
25. Blue Whistling Thrush	*Myiophoneus caeruleus*		1
26. Common Blackbird	*Turdus merula*		2
27. Masked Laughing Thrush	*Garrulax perspicillatus*		5
28. Japanese Bush Warbler	*Cettia diphone*		1
29. Zitting Cisticola	*Cisticola juncidis*	Local Concern	1
30. Yellow-bellied Prinia	*Prinia flaviventris*		1
31. Common Tailorbird	*Orthotomus sutorius*		2
32. Dusky Warbler	*Phylloscopus fuscatus*		1
33. Yellow-browed Warbler	*Phylloscopus inornatus*		7
34. Great Tit	*Parus major*		2
35. Scarlet-backed Flowerpecker	*Dicaeum cruentatum*		2
Flowerpecker	*Dicaeum sp.*		2

Common name	Scientific name	Conservation Concern	No. of birds
36. Fork-tailed Sunbird	*Aethopyga christinae*		1
37. Little Bunting	*Emberiza pusilla*		1
38. White-rumped Munia	*Lonchura striata*		3
39. Scaly-breasted Munia	*Lonchura punctulata*		1
40. Red-billed Starling	*Sturnus sericeus*	Global Concern	20
41. Crested Myna	*Acridotheres cristatellus*		2
42. Grey Treepie	*Dendrocitta formosae*	Local Concern	2
43. Large-billed Crow	*Corvus macrorhynchus*		2
Total no. of species recorded			42

So Lo Pun

Vegetation

3.18.1 The vegetation of So Lo Pun comprised of a mosaic of secondary forest, shrubland, abandoned farmland, marshes, village and mangrove.

3.18.2 Secondary forests were found around the village and also along the stream (Plate 12). Major canopy species included *Schefflera heptaphylla*, *Machilus pauhoi*, *M. gamblei*, *Castanopsis fissa*, *Cleistocalyx operculatus*, *Dimocarpus longan*, and *Elaeocarpus dubius*. Height of the forest is about 6-10m tall, with trees less than 40 cm dbh.

3.18.3 Shrubland was distributed on hillside above the forest and near the mountain ridges. It is largely dominated by *Dicranopteris pedata*, *Rhodomyrtus tomentosa*, *Toxicodendron succedaneum*, *Cratoxylum cochinchinense*, *Miscanthus sinensis*, and *Arundinella nepalensis*. Such habitat if left undisturbed would accumulate more native species and become secondary forest in 10-15 years time.

3.18.4 Abandoned farmland has reverted to grassland habitat from abandoned paddy and is now maintained by the grazing of feral cattle. Grassy wetland marsh has been formed from abandoned paddy. Both habitats are dominated by Poaceae and Cyperaceae.

3.18.5 Mangrove was found at the seaward margin of the So Lo Pun area. It is dominated by *Kandelia candel*, *Aegiceras corniculatum*, *Pandanus tectorius*, *Hibiscus tiliaceus*, and *Cyperus malaccensis* var. *brevifolius*. Height of the vegetation is about 1-2m.

3.18.6 The village at So Lo Pun has been abandoned and has now been encroached by climber and shrub such as *Pueraria lobata* and *Lantana camara*. Fruit trees such as *Dimocarpus longan* and *Litchi chinensis* remain from previous managed plantation.

Flora

3.19.1 The present survey (7 Aug 2003) at So Lo Pun recorded 244 vascular plant species (excluding Orchidaceae), including 31 fern species, two gymnosperm species, and 211 flowering plant species (Appendix 4).

3.19.2 *Cibotium barometz* is under Class II National protection in China. The species is exploited commercially but it is common and widespread in South China and Hong Kong. It was recorded in the secondary forest at So Lo Pun.

3.19.3 *Phymatodes longissimma* is rare in Hong Kong, a single plant was found along the main stream.

3.19.4 *Aquilaria sinensis* is considered globally Vulnerable by IUCN, and is under protection in China and Hong Kong. The species has become very rare in Mainland China because of commercial exploitation but it is locally common in Hong Kong. It was found to be locally uncommon in the secondary forest at So Lo Pun.

3.19.5 In regard to the orchid, 26 individuals of *Goodyera procera* were found along a stream at So Lo Pun. Although it is regarded as very common by Siu (2000), all orchid species are protected in Hong Kong.

3.19.6 Earlier survey in 2000 at So Lo Pun had found *Alsophila spinulosa* further up along the stream (S.C. Ng, pers. comm.). *Alsophila spinulosa* is a restricted plant in forest and is protected in Hong Kong and China (Class II).

3.19.7 The locally rare sea grass, *Zostera japonica*, was observed on the seaward side of mangrove on 19 November 2003. This species was first recorded at So Lo Pun in 1998 (Wong 1999). The distribution of this species is restricted to Lai Chi Wo, Pak Kok Wan, Sam A Tsuen in the NENT, Sheung Sze Wan in Sai Kung, and San Tau in Lantau (Fong 1998).

Mammals

3.20.1 Four infrared cameras were installed at sites showing signs of mammal activity between 9 and 22 December 2003 (Figure 3). Only one of the cameras functioned in the survey. The failure of other cameras was primarily due to technical problems. A total of three mammal species were recorded from four photographic events (Table 16). The Yellow-bellied Weasel (*Mustela kathiah*) (Plate 15) recorded at this site has only been recorded in Pat Sin Leng Country Park (Pei *et al.* 2002), while the Crab-eating Mongoose (*Herpestes urva*) (Plate 13) was previously thought to be restricted to the Deep Bay area (Reels 1996). However, it was recorded by AFCD in Plover Cove and Pat Sin Leng Country Parks in a Country Park and Special Area mammal survey in 2002 (Shek 2003). Both species are regarded as of "Local Concern" (Fellowes *et al.* 2002). The Crab-eating Mongoose is also regarded as a mammal of conservation concern by the Agriculture, Fisheries and Conservation Department (Shek 2003).

3.20.2 The status of the Yellow-bellied Weasel in Hong Kong is not well understood. Cook (1994) reported that a Yellow-throated Marten was seen at Wu Kau Tang in 1994, however, based on the photo record of a Yellow-bellied Weasel in Pat Sin Leng Country Park (Pei 2001), and the description of the Wu Kau Tang animal, Lau (2002) thought that the Wu Kau Tang animal was actually a Yellow-bellied Weasel which locally seems to be restricted to the Northeast New Territories. It is regarded to be of "low priority for conservation action" by AFCD (Shek 2003) because of its possible non-native status. However, its occurrence in Hong Kong may simply represent re-colonisation or be the result of range expansion. This species is widely distributed in southern and central China and is an inhabitant of hill forests (Zhang, 1997). Hence, it is believed that the species is native to Hong Kong. Nevetheless, substantial research on the Weasels' biology and population status is required in order to make informed decisions regarding the need for protection, as has previously been recommended for populations of this species in India. A precautionary approach to investigate the status of all little understood species of possible conservation concern should be taken as outlined in the Earth Summit meeting held in Rio de Janeiro, Brazil in 1992, Agenda 21, which advocated the widespread application of the Precautionary Principle.

Table 16. Mammal species recorded by a single infrared camera trap at So Lo Pun between 9 and 22 December 2003 (Plate 13-15).

Common name	Scientific name	Conservation concern	Records
Chinese Leopard Cat	*Prionailarus bengalensis*		2
Crab-eating mongoose	*Herpestes urva*	Local Concern	1
Yellow-bellied weasel	*Mustela kathiah*	Local Concern	1
Total photo records			**4**

Birds

3.21.1 A total of 33 species were recorded at So Lo Pun (Table 17). In the summer survey on 7 August 2003, 17 species were recorded (Table 14). Most of these species are common and widespread. The presence of the Emerald Dove (*Chalcophaps indica*), Chestnut Bulbul and Greater Necklaced Laughing Thrush indicated that the forest is mature enough to support these forest dependent birds.

3.21.2 In the winter survey on 20 November 2003, 27 species were recorded (Table 17). The Japanese White-eye was dominant. Most of the recorded species are common and widespread in Hong Kong. Calls of the "Local Concern" Grey Treepie (Fellowes *et al.* 2002) were heard on 23 December, indicating the presence of this species at So Lo Pun.

Table 17. List of bird species and their relative abundance at So Lo Pun on 6 August, 19 November and 23 December 2003.

Common name	Scientific name	Conservation concern	6-Aug	19-Nov
1. Great Egret	*Egretta alba*	Potential Regional Concern	1	
2. Osprey	*Pandion haliaetus*	1. Regional Concern 2. Class II China National Protected Species		1
3. Crested Serpent Eagle	*Spilornis cheela*	Class II China National Protected Species	1	
4. Crested Goshawk	*Accipiter trivirgatus*	Class II China National Protected Species		1
5. Spotted Dove	*Streptopelia chinensis*			1
6. Emerald Dove	*Chalcophaps indica*	"Vulnerable" in China Red Data Book	1	
7. Greater Coucal	*Centropus sinensis*	Class II China National Protected Species	1	1
8. Pied Kingfisher	*Ceryle rudis*			1
9. Common Kingfisher	*Alcedo atthis*			1
10. Olive-backed Pipit	*Anthus hodgsoni*			1
11. Red-whiskered Bulbul	*Pycnonotus jocosus*		6	15
12. Chinese Bulbul	*Pycnonotus sinensis*		3	7
13. Chestnut Bulbul	*Hypsipetes castanonotus*		3	12
14. Long-tailed Shrike	*Lanius schach*		2	1
15. Siberian Rubythroat	*Luscinia calliope*			2
16. Oriental Magpie Robin	*Copsychus saularis*		1	2
17. Daurian Redstart	*Phoenicurus auroreus*			2
18. Blue Whistling Thrush	*Myiophoneus caeruleus*		1	1
19. Grey-backed Thrush	*Turdus hortulorum*			2
20. Masked Laughing Thrush	*Garrulax perspicillatus*		3	
21. Greater Necklaced Laughing Thrush	*Garrulax pectoralis*		4	
22. Hwamei	*Garrulax canorus*		2	1
23. Japanese Bush Warbler	*Cettia diphone*			1
24. Yellow-bellied Prinia	*Prinia flaviventris*		3	1
25. Common Tailorbird	*Orthotomus sutorius*		9	5

Common name	Scientific name	Conservation concern	6-Aug	19-Nov
26. Yellow-browed Warbler	*Phylloscopus inornatus*			2
27. Great Tit	*Parus major*		5	1
28. Scarlet-backed Flowerpecker	*Dicaeum cruentatum*			1
29. Fork-tailed Sunbird	*Aethopyga christinae*			3
30. Japanese White-eye	*Zosterops japonicus*		2	51
31. White-rumped Munia	*Lonchura striata*			2
32 Grey Treepie*	*Dendrocitta formosae*	Local Concern		
33. Large-billed Crow	*Corvus macrorhynchus*			1
Total no of species recorded in each survey			**17**	**27**

* Heard on 23 December 2003 during the installation of the cameras

Amphibians

3.22. No detailed amphibian survey was made but one Big-headed Frog (*Rana fujianensis*) was recorded at a lowland stream on 9 December 2003 (Plate 16). The Big-headed Frog and Spotted Narrow-mouthed Frog were previously recorded there in 1999 (Chan 1999). It is regarded as of "Local Concern" (Fellowes *et al.* 2002). This species has previously been reported from the central NT and Plover Cove Country Park (Karsen *et al*. 1998).

Freshwater Fish

3.23 No fish survey was conducted at So Lo Pun during the present survey. Chan (2001) reported eight species from the stream, including *Anguilla japonica, Nicholsicypris normalis, Puntius semifasciolatus, Clarias fuscus, Eleotris oxycephalus, Rhinogobius duospilus, Rhinogobius giurinus,* and *Macropodus opercularis*. All species, except, *Nicholsicypris normalis*, are widespread in Hong Kong, but *A. japonica*, *N. normalis*, *P. semifasciolatus*, *C. fuscus*, and *M. opercularis* are in decline following the gradual loss of lowland habitat. The site is also free of exotic species which is noteworthy for Hong Kong waterways (Chan 2001).

Yung Shue Au

Vegetation

3.24.1 The vegetation of Yung Shue Au comprised of a mosaic of *feng shui* woodland, secondary forest, shrubland, abandoned farmland, marshes, village and mangrove (Plate 17).

3.24.2 It was found just behind the village at Yung Shu Au. It is largely dominated by *Aquilaria sinensis*, *Machilus gamblei*, *Syzygium levinei*, *Schefflera heptaphylla* and *Acronychia pedunculata* at the canopy and *Ardisia quinquegona* and *Psychotria asiatica* in the understorey. The forest is about 6-15m tall with tree up to 60 cm dbh.

3.24.3 Secondary forests were found along the stream. Major canopy species included *Schefflera heptaphylla*, *Syzygium hancei*, *Castanopsis fissa*, *Sterculia lanceolata*, and *Cleistocalyx operculatus*. Height of the forest is about 6-10m tall, with trees less than 40 cm dbh.

3.24.4 Shrubland was distributed on hillside above the forest and near the mountain ridges. It is largely dominated by *Dicranopteris pedata*, *Rhodomyrtus tomentosa*, *Litsea rotundifolia*, *Melastoma sanguineum*, *Smilax china*, and *Miscanthus sinensis*. Such habitat if left undisturbed would accumulate more native species and become secondary forest in 10-15 years time.

3.24.5 Marsh is waterlogged grassy wetland formed from abandoned paddy. It is dominated by *Miscanthus floridulus*, *Microstegium ciliatum*, and *Imperata koenigii*.

3.24.6 Mangrove was found at the seaward margin of the Yung Shue Au area. It is dominated by *Phragmites australis*, *Kandelia candel* and *Hibiscus tiliaceus*. Height of the vegetation is about 1-2m.

3.24.7 Village area in Yung Shue Au had been abandoned and has now been encroached with climber and shrub such as *Pueraria lobata*, *Miscanthus floridulus Ficus hispida*, and *Lantana camara*.

Flora

3.25.1 The 7 Aug 2003 survey to Yung She Au recorded 152 vascular plant species (excluding Orchidaceae), including 15 fern species, two gymnosperm species, and 135 flowering plant species (Appendix 5).

3.25.2 *Cibotium barometz* is under Class II National protection in China. The species is exploited commercially but it is common and widespread in South China and Hong Kong. It was recorded in the secondary forest at Yung Shue Au.

3.25.3 *Diospyros vaccinioides* is considered Critically Endangered by IUCN and is restricted to Guangdong, Guangxi & Hainan, but the species is common in Hong Kong. A few plants were found on the hillside shrubland at Yung Shue Au.

3.25.4 *Rhododendron simsii* is protected in Hong Kong and is common in the terrority. A few plants were found on the hillside shrubland at Yung Shue Au.

3.25.5 *Aquilaria sinensis* is considered globally Vulnerable by IUCN, and is under protection in China and Hong Kong. The species has become very rare in Mainland China because of commercial exploitation but it is locally common in Hong Kong. It was common in the *feng shui* woodland and secondary forest at Yung Shue Au.

Mammals

3.26.1 Two Infrared cameras were installed in sites showing signs of mammal activity between 9 and 22 December 2003 (Figure 3) (Plate 18). A total of five mammal species from 32 records were recorded by these cameras (Table 18). The Malayan Porcupine (*Hystrix brachyura*) had the highest frequency of occurrence, while the Chinese Leopard Cat (*Prionailurus bengalensis*) had the lowest. Although the recorded mammals are widespread and common in Hong Kong, the Malayan Porcupine is regarded as of "Potential Global Concern", while the Indian Muntjac is of "Potential Regional Concern" (Fellowes *et al.* 2002).

3.26.2 Apart from the photo records, indirect evidence of tracks and scats of the Wild Boar and Indian Muntjac were observed during the installation of the cameras on 9 December. Also, three head of feral dogs were seen on the same day.

Table 18. Mammal species recorded by two infrared cameras set at Yung Shue Au between 9 and 22 December 2003.

Common name	Scientific name	Conservation concern	Records
Wild Boar	*Sus scrofa*		8
Indian Muntjac	*Munitacus muntjak*	Potential Regional Concern	6
Malayan Porcupine	*Hystrix brachyura*	Potential Global Concern	13
Small Indian Civet	*Viverra indica*		4
Chinese Leopard Cat	*Prionailurus bengalensis*		1
Total photo records			**32**

Birds

3.27.1 A total of 23 bird species were seen during the summer and winter surveys (Table 19). In the summer survey, 10 bird species were recorded (Table 19). The Red-whiskered Bulbul was dominant. All recorded birds, except the Hair-crested Drongo (*Dicrurus hottentottus*), which is an uncommon summer visitor, are common and widespread residents in Hong Kong.

3.27.2 In the winter survey on 20 November 2003, 17 bird species were recorded. The Red-whiskered and Chinese Bulbuls were the dominant species (Table 19). The record of the "Local Concern" Grey-chinned Minivet (*Pericrocotus solaris*) is of interest. The distribution of this forest bird was restricted to central New Territories in the 1990s (Carey *et al*. 2001). This record indicates that its range extended to the NENT. Also, this bird is a forest specialist, indicating that the nearby forest is mature enough for this bird species.

Table 19. List of birds recorded at Yung Shue Au on 6 August and 19 November 2003.

Common name	Scientific name	Conservation concern	6 Aug	19 Nov
1. Great Egret	*Egretta alba*	Potential Regional Concern	1	
2. Little Egret	*Egretta garzetta*	Potential Regional Concern		1
3. White-bellied Sea Eagle	*Haliaeetus leucogaster*			1
4. Greater Coucal	*Centropus sinensis*	Class II China National Protected Species	1	

Common name	Scientific name	Conservation concern	6 Aug	19 Nov
5. Olive-backed Pipit	*Anthus hodgsoni*			4
6. Grey-chinned Minivet	*Pericrocotus solaris*	Local Concern		3
7. Red-whiskered Bulbul	*Pycnonotus jocosus*		15	3
8. Chinese Bulbul	*Pycnonotus sinensis*		5	5
9. Sooty-headed Bulbul	*Pycnonotus aurigaster*			6
10. Chestnut Bulbul	*Hypsipetes castanonotus*		2	2
11. Long-tailed Shrike	*Lanius schach*		1	
12. Oriental Magpie Robin	*Copsychus saularis*			1
13. Blue Whistling Thrush	*Myiophoneus caeruleus*			1
14. Grey-backed Thrush*	*Turdus hortulorum*			1
15. Hwamei	*Garrulax canorus*		2	
16. Japanese Bush Warbler	*Cettia diphone*			1
17. Common Tailorbird	*Orthotomus sutorius*			2
18. Yellow-browed Warbler	*Phylloscopus inornatus*			2
19. Great Tit	*Parus major*		2	3
20. Fork-tailed Sunbird	*Aethopyga christinae*			2
21. Japanese White-eye	*Zosterops japonicus*			3
22. Hair-crested Drongo	*Dicrurus hottentottus*		2	
23. Large-billed Crow	*Corvus macrorhynchus*		2	
Total no of species recorded in each survey			**10**	**17**

* one photo record of this bird was taken by the infrared camera.

Freshwater fish

3.28 No fish survey was conducted but observations on 19 November 2003 recorded two male specimens of the rare goby *Stiphodon* sp. (Plate 19). This fish genus was previously recorded on Lantau and Hong Kong Island and has not been found in the New Territories (B. Chan, pers. comm.). All *Stiphodon* species in Hong Kong are regarded as of "Global Concern" (Fellowes *et al.* 2002).

Mammal occurrence within the study areas: a comparsion with existing records for protected areas

Introduction

3.29.1 In order to make the obtained data comparable to other sites, further analysis has been carried out. An occurrence index as described and used in studies of mammal distribution in Country Parks (Lai *et al*. 2002, Shek 2003) was calculated.

Methods

3.29.2 The occurrence index (OI) is defined as the number of occurrences of species in a given area per 1000 camera working hours. It has been calculated after discounting repeated camera triggers that have resulted in multiple photographic records from the same individual animal, this was done by examination of the date followed by checking the photographic detail.

3.29.3 The total working hours of each camera was calculated from the installation date of a camera and the last date imprint obtained by the camera. Again this follows as closely as possible the methodology of the above mentioned studies. During this camera trapping effort no time stamp was used on the recorded photographs so an assumption of commencement and completion of trapping effort had to be made. Each active camera trapping night is counted as a 24 hour period. The results are then adjusted to give the individual species' occurrence index for a particular area.

3.29.4 Caution should be taken as our survey effort (camera trap hours and number of installed cameras) varied between the study sites and was different from that in Country Parks reported by Lai *et al.* (2002) and Shek (2003). Hence, the index will have a wide margin of error.

Result and Discussion

3.29.5 Amongst the four sites in our study, all the mammals recorded at Yung Shue Au had the highest OI ratings (Table 20). The results indicate that mammal occurrence and activity is higher than the other sites studied.

3.29.6 The OI of all species, except the Wild Boar and Chinese Ferret Badger, recorded in the four study sites were also higher than those in the Country Park studies (Lai *et al*. 2002, and Shek 2003). Again be reminded that caution should be taken with this comparison as the number of functioning cameras and total number of camera working hours in Yung Shue Au and So Lo Pun were low. Nevertheless, the higher OI may indicate significantly higher population densities of these species in the four sites than other parts of the territory. As most of the survey areas are lowland forests with relatively little human activity, a higher abundance is not unexpected.

Table 20. The occurrence index (OI) of mammals in the study area, and those recorded in Country Parks and Special Areas by Lai *et al.* (2002) and Shek (2003). The OI is defined as statuatory number of occurrences expected per 1000 working hours. Caution should be taken as the sampling effort of this study is different the previous studies (NA: not available).

Species	Sites of present study				Lai *et al.* (2002)	Shek (2003)
	Lin Ma Hang	Kuk Po	So Lo Pun	Yung Shue Au	Country Parks and Special Areas	Country Parks and Special Areas
No of camera installed cameras	7	7	4	2	100	140
No of functioning cameras	7	7	1	2	NA	NA
Working hours	2232	1752	432	336	208,070	588,580
Malayan Porcupine (*Hystrix brachyura*)	2.2	4		15		1.64
Indian Muntjac (*Muntiacus muntjak*)	2.2			6		1.04
Small Indian Civet (*Viverricula indica*)	2.2	0.6		9	0.99	0.82
Wild Boar (*Sus scrofa*)	0.4	8.7		24		0.75
Chinese Ferret Badger (*Melogale moschata*)	0.4				0.81	0.55
Crab-eating Mongoose (*Herpestes urva*)			2.3		0.03	0.05
Yellow-bellied Weasel (*Mustela kathiah*)			2.3		0.01	0.01
Chinese Leopard Cat (*Prionailuru bengalensis*)			2.3	3	0.28	0.26
Feral Cattle (*Bos Taurus*)		1.7				0.14
Feral Dogs (*Canis familiaris*)	1.3				0.95	0.69
Niviventer fulvescens		2.3				
No of species recorded	6	5	3	5	20	17

4. SUMMARY OF FINDINGS

4.1 A total of five forest specialist birds including the Chestnut Bulbul (*Hypsipetes castanonotus*), Orange-headed Thrush (*Zoothera citrinus*), Greater Necklaced Laughing Thrush (*Garrulax pectoralis*), Black-throated Laughing Thrush (*Garrulax chinensis*) and Asian Stubtail (*Urosphena squameiceps*) were recorded at Lin Ma Hang secondary forest, indicating that the forest is of rather high integrity.

4.2 Four rare ferns were found in the *feng shui* wood and secondary forest at Lin Ma Hang, including one species (*Gymnosphaera metteniana*) that has not been recorded in Hong Kong before.

4.3 A healthy and highly diverse community of freshwater fish, including two extremely rare species was found at Lin Ma Hang, indicating that the lowland stream is of high ecological value. This was first noted by Chan (2001).

4.4 The Lin Ma Hang mine system still represents the largest hibernacula for the Large bent-winged bat (*Miniopterus magnater*) in Hong Kong. Little is known of the collective foraging requirements (foraging area around the roost site) of all bat species that occupy this site.

4.5 At San Kwai Tin, the Anderson's Stream Snake (*Opisthotropis andersonii*) of "Potential Global Concern" and Diamond-backed Water Snake (*Sinonatrix aequifasciata*) of "Local Concern" are found in streams, while the Mountain Wolf Snake (*Lycodon ruhstrati*), a species of "Local Concern", was found at the riparian forest. The Mountain Wold Snake was previously recorded in only five sites in Hong Kong.

4.6 At Kuk Po, nine plant species of concern were found in *feng shui* woods including San Uk Ha. A terrestrial biodiversity assessment study of the University of Hong Kong has recommended designating the San Uk Ha *feng shui* wood as a "Conservation Area" zone. The *feng shui* woods of Kuk Po all showed a composition typical of relatively well-preserved lowland forest in South China which has become rare as a result of habitat degradation and economic developments.

4.7 Three plant species of conservation concern were found in the hillside secondary forest at San Kwai Tin, including one species that had not previously been recorded in Hong Kong.

4.8 A single individual of the rare plant *Phymatodes longissimma* was found along the main stream at So Lo Pun.

4.9 The locally rare sea grass, *Zostera japonica*, was observed to the seaward side of the mangroves at So Lo Pun. It was first recorded at So Lo Pun in 1998. This species was previously recorded from five sites in Hong Kong.

4.10 The rare Yellow-bellied Weasel and Crab-eating Mongoose, both species of "Local Concern", were recorded by infrared camera at So Lo Pun. The Crab-eating Mongoose is regarded as a mammal of conservation concern by AFCD.

4.11 The freshwater fish, *Stiphodon* sp., a species of "Global Concern" was found in the lowland stream at Yung Shue Au. This is the first record of *Stiphodon* sp. in the New Territories.

5. THREATS

Development at Lin Ma Hang – Eastern express

5.1 According to the HK 2030 stage III consultation digest, another cross-border express is proposed to be built in the North East of Hong Kong. News reports suggest that Lin Ma Hang could be one of the landing options on the Hong Kong side (*Mingpao* dated 4 December 2003). If pursued, this construction and its associated developments could drastically change land use pattern in Lin Ma Hang and thus cause serious disturbance and adverse impact on wildlife, in particular effecting the freshwater fish community and bats which make use of the Lin Ma Hang SSSI and surrounding feeding habitats. Any infrastructure construction of such scale is surely to have a detrimental effect upon the stream and its associated fauna.

Channelization of Lin Ma Hang Stream

5.2 A channelization project of Lin Ma Hang stream was proposed by the Drainage Services Department in May 2002. The project comprises the construction of about 250 m of drainage channels and associated works. Although the project is claimed to be ecologically friendly, there are no local examples of any channelization works that do not adversely alter the stream habitats, and thus threaten the survival of the freshwater fish. Any modification of the existing stream habitat is strongly discouraged.

Mikania invasion

5.3 Mikania invasion was noted in lowland habitats, in particular abandoned farmlands, at Lin Ma Hang (Plate 20), Kuk Po, So Lo Pun and Yung Shue Au. The invasion is considered to be an ecological problem as it could displace the original vegetation by smothering, resulting in loss of biodiversity. This will, in turn, reduce the availability of habitats to other wildlife.

Collection of wildlife

5.4 During the bird survey in November, the endemic Hong Kong Paradise Fish (*Macropodus hongkongensis*) was found in tanks at a farm at Kuk Po (Plate 21). The conservation status of this fish is regarded as of "Global Concern". As trading of this species is not common in Hong Kong, it is highly suspected that captive individuals are wild caught in the nearby area, presumably at the freshwater marsh. Although the Hong Kong Paradise Fish is not a protected species under the Wild Animal Protection Ordinance, any collection of this endemic species would threaten the population, as it is only found in Hong Kong.

Unplanned development for ecotourism

5.5.1 Construction activities in relation to an eco-farm at Ng To, Kuk Po, which is in close proximity to Plover Cove Country Park, were noted on 15 August 2003. The construction activities included huts, BBQ facilities and channelization of streams (Plate 22). The channelization is of concern as it could destroy and degrade the stream habitats. Subsequent communication with the Lands Department revealed that the subject area of BBQ facilities is on government lands, thus it is illegal. Restoration work has been noted and no such facilities were seen during a subsequent visit in November 2003. It is recommended that it should have specific planning, instead of merely vague OZP exercise, to preserve the environment of ecologically sensitive area such as NENT if the government intends to develop eco-tourism in this area. In addition, the ecotourism should include the local community, e.g. villagers, tour operators and green groups should also be consulted prior to the operation of these tours.

5.5.2 According to a WTO-UNEP concept paper (Anon 2002), the following criteria should be incorporated in the planning and design of eco-tours

i. All nature-based forms of tourism in which the main motivation of the tourists is the observation and appreciation of nature as well as the traditional cultures prevailing in natural areas.
ii. Tours should contain educational and interpretation features.
iii. Tours should generally, but not exclusively be organised for small groups by specialised and small, locally owned businesses. Foreign operators of varying sizes also organise, operate and/or market ecotourism tours, generally for small groups.
iv. Tour should minimises negative impacts upon the natural and socio-cultural environment.
v. Tour should supports the protection of natural areas by
• generating economic benefits for host communities, organisations and authorities managing natural areas with conservation purposes,
• providing alternative employment and income opportunities for local communities,
• increasing awareness towards the conservation of natural and cultural assets, both among locals and tourists.

6. OPPORTUNITIES AND RECOMMENDATIONS

To designate Lin Ma Hang, San Kwai Tin and Robin's Nest as a new Country Park

6.1.1 Our preliminary surveys indicate that *feng shui* woods and secondary forest at Lin Ma Hang and San Kwai Tin are of high ecological value due to their rich plant diversity. The stream at Lin Ma Hang is also of very high biodiversity value. Robin's Nest was identified as a potential country park in the Territorial Development Strategy Review study in 1993 (Anon 1993). However, there was no time schedule for the designation as no immediate threats were identified and part of the sites fell within the FCA. In view of the likely threats posed by the opening up of FCA and various infrastructure development planned, this area is no longer protected by its remoteness. It is recommended that a higher conservation priority should be given to this area. Specifically we propose considering the designation of Lin Ma Hang, San Kwai Tin and Robin's Nest as a new Country Park. The proposed country park will not only protect rich plant diversity and other terrestrial wildlife, but also provide a "green corridor" between the adjacent Wutongshan National Forest Park in Shenzhen and Hong Kong, the last such corridor! (Plate 23)

6.1.2 According to our rapid biodiversity of Wutongshan National Forest in 2001 (Kadoorie Farm and Botanic Garden 2002), rare wildlife not present in Hong Kong were recorded, indicating that this forest park is of high ecological and conservation value. Active management in the proposed Country Park could enhance the movement of wildlife between Hong Kong and mainland China.

6.1.3 The sustained proliferation of biodiversity in Hong Kong will benefit from a natural free flow of both species and genes into and out of the Hong Kong populations, for many terrestrial based species green corridors provide the last opportunity for such movements to take place. Allowing our last natural land links to the biomass of the Chinese mainland to be severed would effectively isolate much of Hong Kong's fauna. The ultimate effect of genetic isolation can be as severe as declining fecundity and eventual population collapse. Severing the green linkages would also prevent the natural re-colonization of our recovering forest with species which are currently absent, and an incomplete ecosystem is not a stable or sustainable system.

To approve the designation of the Lin Ma Hang Stream as a Site of Special Scientific Interest

6.2 A proposal on designation of the Lin Ma Hang stream as a Site of Special Scientific Interest due to the high diversity of freshwater fish of high conservation concern was submitted by the University of Hong Kong in 1999. The application has been under consideration since then. Our surveys reinforce the finding of The University of Hong Kong, and confirm that the fish community structure remains stable and continues to command further attention to the consideration of its designation as an SSSI.

To protect the *feng shui* wood at San Uk Ha, Kuk Po and the secondary woodland at So Lo Pun by extending Plover Cove Country Park Boundary

6.3.1 Our survey indicates that the San Uk Ha *feng shui* wood is of botanical interest, while the secondary woodland at So Lo Pun is important for mammals. These wooded areas are in close proximity to Plover Cove Country Park. Currently, part of the Kuk Po San Uk Ha *feng shui* wood falls within the boundary of Plover Cove Country Park. An extension of the country park boundary could enhance the protection of the rest of the *feng shui* wood and add to the overall natural value of this country park.

6.3.2 Another option to protect these woodlands would be to designate them as "Special Area", as is the case for the *feng shui* wood at Lai Chi Wo

To designate the seagrass (*Zosterus japonica*) and mangrove community at So Lo Pun as a Site of Special Scientific Interest

6.4.1 The seagrass, *Zosterus japonica*, has only been found at six locations in Hong Kong including four in the NENT, one in Sai Kung and one in Lantau (Fong 1998). Only the population at Lai Chi Wo and San Tau on Lantau are protected by the SSSI status. Currently, the seagrass and mangrove community at So Lo Pun are only protected by their remoteness.

6.4.2 Prior to 1970s, aerial photos revealed that ricefields were the dominant land use in the lowland of So Lo Pun including the area now covered by seagrass and mangrove (Wong 1999). It took its present form after the abandonment of rice cultivation in the early 1970s.

6.4.3 As So Lo Pun falls outside any boundary of Outline Zoning Plans, land use control is weak and any agricultural activities are always permitted without approval by the authority concerned. Drawing on the experience of the Sham Chung case, any inappropriate development could threaten the wildlife habitats. The mangrove and freshwater marsh at Sham Chung, which were identified as a wetland of high ecological value by a HKU freshwater wetland survey in the mid-1990s (Dudgeon and Chan 1996), were protected only by their remoteness. Lacking adequate protection, these wetlands were destroyed in 2000 by ground levelling, drainage and cultivation of turf. During the cultivation, mangrove trees were cleared and the marsh was filled for so-called “agricultural activity”. As a result, the ecological value of Sham Chung wetland was seriously degraded by these inappropriate activities.

6.4.5 It is feared that these activities could be repeated at So Lo Pun, as it is also a prime lowland flatland offering an attractive site for development. So Lo Pun is more attractive as it is in close proximity to eastern Shenzhen, and Yantian port. Without adequate protection eventual development in these sites is inevitable and these locally rare habitat types will be lost, this would not be in line with any environmentally aware governing policies.

Further infrared camera trap survey of mammals

6.5 Although only one camera functioned at So Lo Pun, striking results were none the less obtained. The Yellow-bellied Weasel, a relatively newly recorded species in Hong Kong, and Crab-eating Mongoose (both of “Local Concern”) were recorded at So Lo Pun. Indeed a higher Occurrence Index was recorded for mammals in the present study sites than for those in Country Parks and Special Areas. In order to better understand the mammal diversity in the FCA and NENT, a standardised and comprehensive survey should be conducted. Again following the precautionary approach only upon collection of more extensive mammalian population and abundance data can effective decisions be made concerning the conservation needs of these areas.

7. ACKNOWLEDGMENTS

We would like to thank the Border Police for allowing infrared camera installation in the Frontier Closed Area, and the Frontier Closed Area Permit Office of Hong Kong Police Force for issuing the permits for surveyors. Gratitude was also expressed to Ecosystems Ltd for providing voluntary professional bird survey services. We are grateful to Henry Lai for his assistance in camera trapping exercises, and Jennifer Chan and Carmen Ng for logistical support. This work was funded by the Kadoorie Farm and Botanic Garden.

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Figure 1. The location of Lin Ma Hang (A), San Kwai Tin (B), Kuk Po (C), So Lo Pun (D) and Yung Shue Au (E).

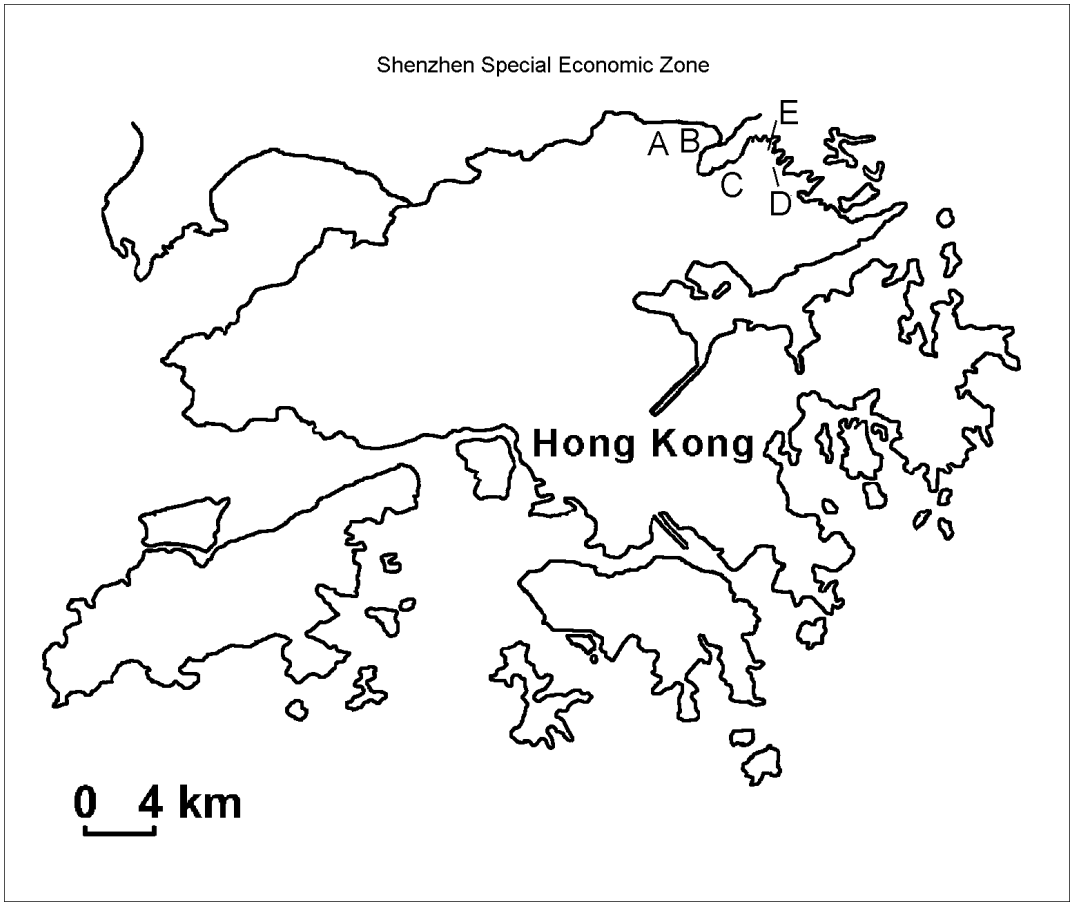


Figure 2. Location of the seven camera traps (black spots), and the old house feng shui wood at Lin Ma Hang (X).

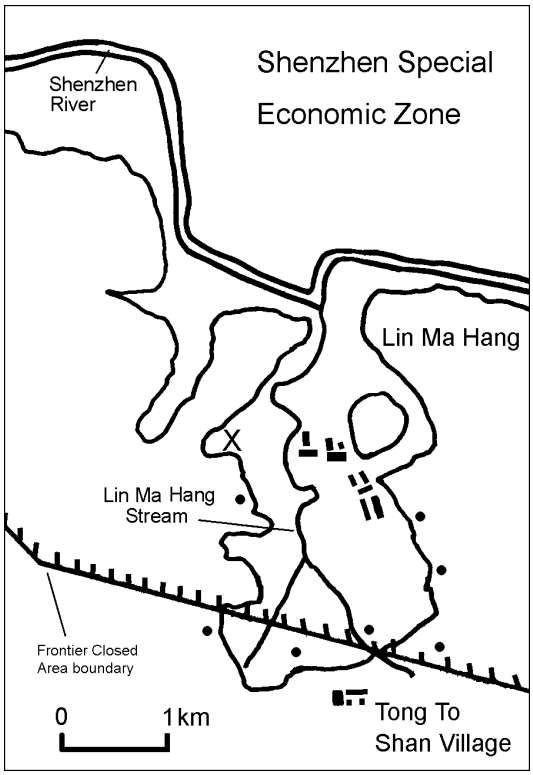
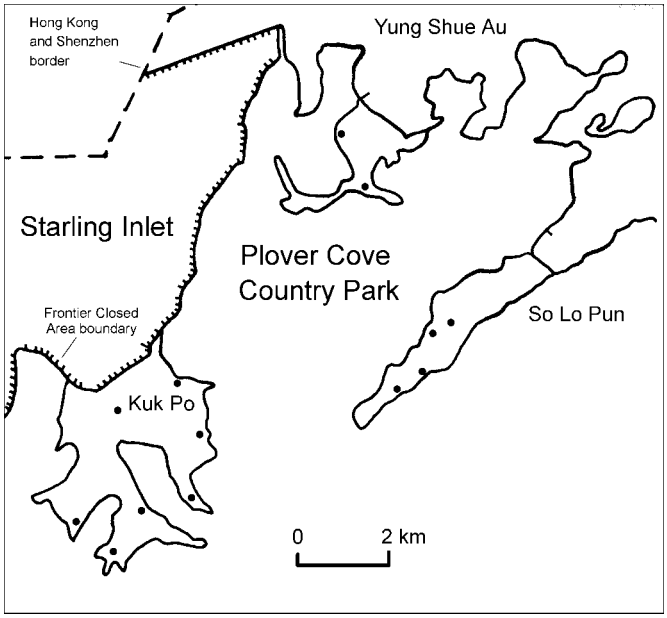


Figure 3. The location of the camera traps at Kuk Po, So Lo Pun and Yung Shue Au in 2003 (Black spots). A total of seven were installed at Kuk Po, while four and two were installed at So Lo Pun and Yung Shue Au, respectively.



Appendix 1. Plant species recorded at Lin Ma Hang on 10 July 2003, with relative abundance: +++ = abundant or dominant; ++ = common; + = rare. Species that are Nationally Protected (Protected I or II, following Yu (1999)), Protected in Hong Kong (Protected HK), globally threatened (IUCN, 2002) or globally restricted are indicated.

Families	Species	Abandoned farmland	Village	Shrub	Secondary forest	Lin Ma Hang FSW	Old House FSW
PTERIDOPHYTA							
Adiantaceae	*Adiantum flabellulatum* L.	++				++	++
Adiantaceae	*Adiantum philippense* L.						+
Athyriaceae	*Callipteris esculenta* (Retz.) J.Sm.		+++				
Blechnaceae	*Blechnum orientale* L.	++					
Blechnaceae	*Brainea insignis* (Hook.) J. Sm. (#)						++
Cyatheaceae	*Alsophila spinulosa* (Wall. ex Hook.) R.M.Tryon (*)				+		
Cyatheaceae	*Gymnosphaera metteniana* (Hance) Tagawa (*)				+		
Cyatheaceae	*Gymnosphaera podophylla* (Hook.) Copel. (*)				+		
Dennstaedtiaceae	*Microlepia hancei* Prantl				+		
Dennstaedtiaceae	*Microlepia marginata* (Houtt.) C. Chr.				+		
Gleicheniaceae	*Dicranopteris pedata* (Houtt.) Nakaike	++					++
Lindsaeaceae	*Lindsaea ensifolia* Sw.			+			
Lindsaeaceae	*Lindsaea heterophylla* Dryand.			+			
Lindsaeaceae	*Lindsaea orbiculata* (Lam.) Mett. ex Kuhn			++			
Lycopodiaceae	*Palhinhaea cernua* (L.) Franco & Vasc.				+		
Lycopodiaceae	*Lygodium japonicum* (Thunb.) Sw.	++			++	++	
Lycopodiaceae	*Lygodium scandens* (L.) Sw.	+					
Nephrolepidaceae	*Nephrolepis auriculata* (L.) Trimea				+		
Osmundaceae	*Osmunda vachellii* Hook.				+		
Polyodiaceae	*Pyrrosia adnascens* (Sw.) Ching					+	
Pteridaceae	*Pteris ensiformis* Burm. f.	+					
Pteridaceae	*Pteris semipinnata* L.	++				++	++
Thelypteridaceae	*Cyclosorus interruptus* (Willd.) H. Ito	+++					
Thelypteridaceae	*Cyclosorus latipinnus* (Benth.)						+
Thelypteridaceae	*Cyclosorus parasiticus* (L.) Farw.				++		
Thelypteridaceae	*Parathelypteris angulariloba*(Ching)						+
Thelypteridaceae	*Pronephrium simplex* (Hook.) Holttum				+		

Families	Species	Abandoned farmland	Village	Shrub	Secondary forest	Lin Ma Hang FSW	Old House FSW
Thelypteridaceae	*Pseudocyclosorus subochthodes* (Ching) Ching				+		
GYMNOSPERMAE							
Gnetaceae	*Gnetum luofuense* C. Y. Cheng				++		
Pinaceae	*Pinus massoniana* Lamb.				+		
ANGIOSPERMAE							
Dicotyledonae							
Alangiaceae	*Alangium chinense* (Lour.) Harms.	++				++	
Anacardiaceae	*Rhus chinensis* Mill.	++					
Anacardiaceae	*Toxicodendron succedaneum* (L.) Kuntze.	+			+++	++	++
Annonaceae	*Desmos chinensis* Lour.	+++				++	++
Annonaceae	*Uvaria grandiflora* Roxb.				+		
Annonaceae	*Uvaria microcarpa* Champ. ex Benth.	++				+++	++
Apiaceae	*Centella asiatica* (L.) Urb.	+					
Apocynaceae	*Strophanthus divaricatus* (Lour.) Hook. & Arn.	++			+		
Aquifoliaceae	*Ilex asprella* (Hook. & Arn.) Champ.ex Benth.	++		++		++	+
Aquifoliaceae	*Ilex pubescens* Hook. & Arn.				+	+	
Aquifoliaceae	*Ilex rotunda* Thunb.	++					++
Araliaceae	*Eleutherococcus trifoliatus* (L.) S.Y. Hu	++				++	
Araliaceae	*Schefflera heptaphylla* (L.) Frodin	+++			++		++
Asclepiadaceae	*Gymnema sylvestre* (Retz.) R. Br. ex Schult.	+					
Asclepiadaceae	*Toxocarpus wightianus* Hook. & Arn.			+			
Asclepiadaceae	*Tylophora ovata* (Lindl.) Hook. ex Steud.	+					
Asteraceae	*Bidens pilosa* L.	++					
Asteraceae	*Crassocephalum crepidioides* (Benth.) S. Moore	+					
Asteraceae	*Eupatorium catarium* Veldkamp	+					
Asteraceae	*Eupatorium odoratum* L.		++				
Asteraceae	*Mikania micrantha* Kunth	++					
Asteraceae	*Senecio scandens* Buch.-Ham.	+					
Asteraceae	*Vernonia cumingiana* Benth.				++		
Asteraceae	*Vernonia solanifolia* Benth.				+		
Balsaminaceae	*Impatiens chinensis* L.	++					

Families	Species	Abandoned farmland	Village	Shrub	Secondary forest	Lin Ma Hang FSW	Old House FSW
Burseraceae	*Canarium album* (Lour.) Raeusch.				+		
Burseraceae	*Canarium pimela* Leenhouts				+		
Caesalpiniaceae	*Caesalpinia crista* L.						+
Caprifoliaceae	*Lonicera* sp.						+
Caprifoliaceae	*Viburnum odoratissimum* Ker Gawl.	++		++			++
Caprifoliaceae	*Viburnum sempervirens* Koch				+		
Celastraceae	*Celastrus kusanoi* Hayata				+		
Celastraceae	*Euonymus sp.*				+		+
Chloranthaceae	*Sarcandra glabra* (Thunb.) Nakai	+++				++	+++
Clusiaceae	*Cratoxylum cochinchinense* (Lour.) Blume	+++		++		+++	+++
Clusiaceae	*Garcinia oblongifolia* Champ. ex Benth.					++	++
Connaraceae	*Rourea microphylla* (Hook. & Arn.) Planch.					+	
Convolvulaceae	*Ipomoea cairica* (L.) Sweet	++	++				
Daphniphyllaceae	*Daphniphyllum calycinum* Benth	++					++
Dilleniaceae	*Tetracera asiatica* (Lour.) Hoog.	+++				++	+
Ebenaceae	*Diospyros kaki* Thunb.				+		
Elaeagnaceae	*Elaeagnus loureiri* Champ. ex Benth.	+			++		+
Elaeocarpaceae	*Elaeocarpus chinensis* (Gardner & Champ.) Hook. f. ex Benth.				+		
Ericaceae	*Rhododendron simsii* Planch.	+					
Escalloniaceae	*Itea chinensis* Hook. & Arn	++				+	
Euphorbiaceae	*Alchornea trewioide*s (Benth.) Müll. Arg.	+					
Euphorbiaceae	*Antidesma bunius* (L.) Spreng.				+		+
Euphorbiaceae	*Aporosa dioica* (Roxb.) Müll. Arg.	++				+++	++
Euphorbiaceae	*Bischofia javanica* Blume						+
Euphorbiaceae	*Breynia fruticosa* (L.) Hook. f.	+				++	
Euphorbiaceae	*Bridelia tomentosa* Blume	+				++	
Euphorbiaceae	*Flueggea virosa* (Roxb. ex Willd.) Voigt.	++	++				
Euphorbiaceae	*Glochidion eriocarpum* Champ. ex Benth.				++	++	++
Euphorbiaceae	*Glochidion lanceolarium* (Roxb.) Voigt						+
Euphorbiaceae	*Glochidion philippicum* (Cav.) C.B. Rob.	+					

Families	Species	Abandoned farmland	Village	Shrub	Secondary forest	Lin Ma Hang FSW	Old House FSW
Euphorbiaceae	*Glochidion wrightii* Benth.				++		
Euphorbiaceae	*Glochidion zeylanicum* (Gaertn.) A. Juss.		++		++		
Euphorbiaceae	*Macaranga tanarius* (L.) Müll. Arg.		++			+++	
Euphorbiaceae	*Mallotus apelta* (Lour.) Müll. Arg.	+					
Euphorbiaceae	*Phyllanthus emblica* L.				+		
Euphorbiaceae	*Phyllanthus reticulatus* Poir.		++				
Euphorbiaceae	*Sapium discolor* (Champ. ex Benth.) Müll. Arg.				+		
Euphorbiaceae	*Sapium sebiferum* (L.) Roxb.	+					
Fagaceae	*Castanopsis fissa* (Champ. ex Benth.) Rehder & E. H. Wilson				++		
Flacourtiaceae	*Xylosma longifolium* Clos					+	
Lauraceae	*Cinnamomum camphora* (L.) J. Presl.				+++	+++	+
Lauraceae	*Lindera communis* Hemsl.					++	++
Lauraceae	*Litsea cubeba* (Lour.) Pers.	+					
Lauraceae	*Litsea glutinosa* (Lour.) C. B. Rob.	+		++			++
Lauraceae	*Litsea rotundifolia* Hemsl. var. *oblongifolia* (Nees) C. K. Allen	+++				++	
Lauraceae	*Machilus breviflora* (Benth.) Hemsl.						+
Lauraceae	*Machilus chekiangensis* S.K. Lee				+		
Lauraceae	*Machilus pauhoi* Kanehira	+			++		++
Loranthaceae	*Macrosolen cochinchinensis* (Lour.) Tiegh.					+	
Loranthaceae	*Taxillus sutchuenensis* (Lecomte) Danser			+			
Lythraceae	*Rotala rotundifolia* (Buch.-Ham. ex Roxb.) Koehne		+				
Melastomataceae	*Melastoma candidum* D. Don		+++	+++			
Menispermaceae	*Stephania longa* Lour.		++				
Mimosaceae	*Albizia lebbeck* (L.) Benth,	+					
Mimosaceae	*Pithecellobium clypearia* (Jack) Benth.				+		
Mimosaceae	*Pithecellobium lucidium* Benth.			+			
Moraceae	*Ficus fistulosa* Reinw. ex Blume				++		++
Moraceae	*Ficus formosana* Maxim.				++		++
Moraceae	*Ficus hirta* Vahl	+++				++	+
Moraceae	*Ficus hispida* L. f.	+			++		
Moraceae	*Ficus microcarpa* L. f.						++
Moraceae	*Ficus pumila* L.	++	++				++

Families	Species	Abandoned farmland	Village	Shrub	Secondary forest	Lin Ma Hang FSW	Old House FSW
Moraceae	*Ficus variegata* Blume var. *chlorocarpa* (Benth.) King					+	++
Moraceae	*Ficus variolosa* Lindl. ex Benth.	+					
Myrsinaceae	*Ardisia crenata* Sims	+			+		+
Myrsinaceae	*Ardisia quinquegona* Blume				++	++	++
Myrsinaceae	*Embelia laeta* (L.) Mez	++					
Myrsinaceae	*Maesa japonica* (Thunb.) Moritzi & Zoll.	++		++			++
Myrtaceae	*Cleistocalyx operculatus* (Roxb.) Merr. & L. M. Perry	+			++		++
Myrtaceae	*Syzygium hancei* Merr. & L. M. Perry	++			++	++	+++
Myrtaceae	*Syzygium jambos* (L.) Alston				+		
Myrtaceae	*Syzygium levinei* (Merr.) Merr. & L. M. Perry					+++	++
Oleaceae	*Ligustrum sinense* Lour.					+	
Oleaceae	*Osmanthus matsumuranus* Hayata				+		
Papilionaceae	*Cajanus scarabaeoides* (L.) Thouars	+					
Papilionaceae	*Canavalia rosea* (Sw.) DC.		+				
Papilionaceae	*Dalbergia benthami* Prain	++					
Papilionaceae	*Dalbergia hancei* Benth.			++		++	
Papilionaceae	*Millettia nitida* Benth.					+	
Papilionaceae	*Phyllodium elegans* (Lour.) Desv.	++					
Papilionaceae	*Tadehagi triquetrum* (L.) H. Ohashi	+		++			
Piperaceae	*Piper hancei* Maxim.				+		
Polygonaceae	*Polygonum lapathifolium* L.		+				
Rhamnaceae	*Berchemia floribunda* (Wall.) Brongn.	+					
Rhamnaceae	*Paliurus ramosissimus* (Lour.) Poir.				+		
Rhamnaceae	*Sageretia thea* (Osbeck) M.C. Johnst.	+		++			
Rosaceae	*Rhaphiolepis indica* (L.) Lindl.			+			+
Rosaceae	*Rosa multiflora* Thunb. var. *cathayensis* Rehder & E.H. Wilson	+					
Rosaceae	*Rubus parvifolius* L.	+					
Rosaceae	*Rubus reflexus* Ker	+		++			
Rubiaceae	*Adina pilulifera* (Lam.) Franch. ex Drake				++	++	
Rubiaceae	*Aidia canthioides* (Champ. ex Benth.) Masam.				++		
Rubiaceae	*Aidia pycnantha* (Drake) Tirveng.					++	
Rubiaceae	*Canthium dicoccum* (Gaertn.) Teysmann & Binnedijk				++		++

Families	Species	Abandoned farmland	Village	Shrub	Secondary forest	Lin Ma Hang FSW	Old House FSW
Rubiaceae	*Catunaregam spinosa* (Thunb.) Tirveng.					+	
Rubiaceae	*Gardenia jasminoides* J. Ellis					++	
Rubiaceae	*Hedyotis hedyotidea* (DC.) Merr.	++				++	
Rubiaceae	*Mussaenda pubescens* W. T. Aiton	++					
Rubiaceae	*Ophiorrhiza pumila* Champ. ex Benth.				+		
Rubiaceae	*Paederia scandens* (Lour.) Merr. var. *tomentosa* (Blume) Hand.-Mazz.	+					
Rubiaceae	*Pavetta hongkongensis* Brem.				+	+	+
Rubiaceae	*Psychotria asiatica* L.	++				+++	+
Rubiaceae	*Psychotria serpens* L.		++	++		++	
Rubiaceae	*Tarenna attenuata* (Voigt) Hutch.					+	
Rutaceae	*Acronychia pedunculata* (L.) Miq.	+			++		
Rutaceae	*Atalantia buxifolia* (Poir.) Oliv. ex Benth.					+	
Rutaceae	*Evodia glabrifolia* (Champ. ex Benth.) C.C. Huang			+		+	
Rutaceae	*Evodia lepta* (Spreng.) Merr.	++		++			
Rutaceae	*Glycosmis parviflora* (Sims) Little					+	+
Rutaceae	*Zanthoxylum nitidum* (Roxb.) DC.	++				++	+
Santalaceae	*Dendrotrophe frutescens* (Champ. ex Benth.) Danser					+	
Sapindaceae	*Cardiospermum halicacabum* L.	+					
Sapindaceae	*Dimocarpus longan* Lour.		++		+	++	++
Sapindaceae	*Litchi chinensis* Sonn.				+		
Sapotaceae	*Sapindus saponaria* L.	+		++			
Scrophulariaceae	*Lindernia crustacea* (L.) F. -Muell.	+					
Simarubaceae	*Brucea javanica* (L.) Merr.				+		
Sterculiaceae	*Helicteres angustifolia* L.	+					
Sterculiaceae	*Pterospermum heterophyllum* Hance				+		
Sterculiaceae	*Sterculia lanceolata* Cav.	++				++	++
Theaceae	*Adinandra millettii* (Hook. & Arn.) Benth. & Hook. f. ex Hance			+			
Theaceae	*Eurya chinensis* R. Br.						+
Theaceae	*Schima superba* Gardn. et Champ.	+++			+++	+++	
Thymelaeaceae	*Aquilaria sinensis* (Lour.) Spreng.	++			++	+++	
Tiliaceae	*Microcos paniculata* L.	+				+++	
Ulmaceae	*Celtis tetrandra* Roxb. subsp. *sinensis* (Pers.) Y.C. Tang	+++			+++		+++
Urticaceae	*Boehmeria nivea* (L.) Gaudich.		++				

Families	Species	Abandoned farmland	Village	Shrub	Secondary forest	Lin Ma Hang FSW	Old House FSW
Verbenaceae	*Lantana camara* L.	++					
Verbenaceae	*Vitex negundo* L.	++	++				
Viscaceae	*Viscum articulatum* Burm. f.						+
Vitaceae	*Ampelopsis cantoniensis* (Hook. & Arn.) Planch.	++					++
Vitaceae	*Vitix flexuosa Thumb.*	+				+	
Monocotyledonae							
Agavaceae	*Cordyline fruticosa (L.)*					+	
Araceae	*Acorus tatarinowii* Schott		++				
Araceae	*Alocasia cucullata* (Lour.) G. Don		++				
Araceae	*Alocasia macrorrhiza* (L.) Schott				+		
Commelinaceae	*Commelina communis* L.		++				
Commelinaceae	*Murdannia triquetra* (Wall. ex C.B. Clarke) A. Brückn.	+++					
Cyperaceae	*Cyperus haspans* L.	++					
Cyperaceae	*Gahnia tristis* Nees				++		
Cyperaceae	*Hypolytrum hainanense* (Merr.) Ts. Tang & F. T. Wang				+		
Cyperaceae	*Kyllinga brevifolia* Rottb.		+				
Cyperaceae	*Pycreus polystachyos* (Rottb.) P. Beauv.	++					
Cyperaceae	*Scleria ciliaris* Nees	++					
Liliaceae	*Asparagus cochinchinensis* (Lour.) Merr.	+					
Liliaceae	*Dianella ensifolia* (L.) DC.	+					
Liliaceae	*Heterosmilax japonica* Kunth			++		+	
Liliaceae	*Liriope spicata* (Thunb.) Lour.	++				++	+
Liliaceae	*Ophiopogon reversus*				+		
Liliaceae	*Smilax china* L.	+					
Liliaceae	*Smilax glabra* Roxb.				+	+	
Orchidaceae	*Goodyera viridiflora* (~)				+		
Pandanaceae	*Pandanus forceps* Martelli				++	+	
Poaceae	*Imperata koenigii* (Retz.) P. Beauv.	+++					
Poaceae	*Isachne globosa* (Thunb.) Kuntze	+++					
Poaceae	*Lophatherum gracile* Brongn.	++					
Poaceae	*Microstegium ciliatum* (Trin.) A. Camus	+++					
Poaceae	*Miscanthus floridulus* (Labill.) Warb. ex K. Schum & Lauterb.	+					

Families	Species	Abandoned farmland	Village	Shrub	Secondary forest	Lin Ma Hang FSW	Old House FSW
Poaceae	*Panicum repens* L.	+++					
Poaceae	*Paspalum orbiculare* Forst.	++					
Poaceae	*Phragmites australis* (Cav.) Trin. ex Steud.		++				
Poaceae	*Saccharum arundinaceum* Retz.	++					
Poaceae	*Thysanolaena maxima* (Roxb.) Kuntze				+		

Remarks

#: *Brainea insignis* is protected in China (II)
*: *Alsophila spinulosa*, *Gymnosphaera metteniana* and *Gymnosphaera podophylla* are protected in both China (II) and Hong Kong
~: Protected in Hong Kong

Appendix 2. Plant species recorded at Kuk Po on 19 Jun 2003, with relative abundance: +++ = abundant or dominant; ++ = common; + = rare. Species that are Nationally Protected (Protected I or II, following Yu (1999)), Protected in Hong Kong (Protected HK), globally threatened (IUCN, 2002) or globally restricted are indicated.

Family	Species	Marsh	Abandoned Farmland	Village	Secondary forest	Feng shui woods			
						Sam To	Ng To	San Uk Ha	Lo Wai
PTERIDOPHYTA									
Adiantaceae	*Adiantum flabellulatum* L.					++		++	
Adiantaceae	*Adiantum malesianum* J. Ghatak								+
Aspidiaceae	*Tectaria subtriphylla* (Hook. & Arn.) Copel.					++			
Athyriaceae	*Diplazium subsinuatum* (Wall. ex Hook. & Grev.) Tagawa				++				
Blechniaceae	*Blechnum orientale* L.					++			
Bolbitidaceae	*Bolbitis subcordata* (Copel.) Ching						++		
Dennstaedtiaceae	*Microlepia hancei* Prantl				+				+
Dicksoniaceae	*Cibotium barometz* (L.) J. Sm.				++	++	++	+++	++
Lygodiaceae	*Lygodium scandens* (L.) Sw.					+			
Polypodiaceae	*Colysis elliptica* (Thunb.) Ching						+		
Polypodiaceae	*Microsorium fortunei* (T. Moore) Ching						+		
Polypodiaceae	*Pyrrosia adnascens* (Sw.) Ching			+					
Pteridaceae	*Pteris ensiformis* Burm. f.								++
Pteridaceae	*Pteris fauriei* Hieron.								++
Pteridaceae	*Pteris semipinnata* L.				++	+	++		++
Selaginellaceae	*Selaginella delicatula* (Desv. ex Poir.) Alston						++		
Thelypteridaceae	*Cyclosorus parasiticus* (L.) Farw.			++	++				
Thelypteridaceae	*Cyclosorus interruptus* (Willd.) H. Ito	+++							
Thelypteridaceae	*Pronephrium simplex* (Hook.) Holttum					+++		+++	++
GYMNOSPERMAE									
Gnetaceae	*Gnetum luofuense* C. Y. Cheng					+++		+++	
ANGIOSPERMAE									
Dicotyledonae									
Acanthaceae	*Championella tetrasperma* (Champ. ex Benth.) Brem.						+		
Acanthaceae	*Justicia ventricosa* Wall.			+					
Acanthaceae	*Thunbergia grandiflora* Roxb.				+				
Actinidiaceae	*Saurauia tristyla* DC.				++	++			
Alangiaceae	*Alangium chinense* (Lour.) Harms.			++		+	++	++	
Anacardiaceae	*Choerospondias axillaris* (Roxb.) B.L. Burtt & A.W. Hill								+
Anacardiaceae	*Mangifera indica* L.			++					
Anacardiaceae	*Rhus chinensis* Mill.				++				
Anacardiaceae	*Toxicodendron succedaneum* (L.) Kuntze.				++				
Annonaceae	*Desmos chinensis* Lour.					+++		++	+++

Family	Species	Marsh	Abandoned Farmland	Village	Secondary forest	Feng shui woods			
						Sam To	Ng To	San Uk Ha	Lo Wai
Annonaceae	*Fissistigma glaucescens* (Hance) Merr.				+			++	
Annonaceae	*Popowia pisocarpa* (Blume) Endl.								+
Annonaceae	*Uvaria grandiflora* Roxb.						++		+
Annonaceae	*Uvaria microcarpa* Champ. ex Benth.				++	++	+++	+++	+++
Apocynaceae	*Melodinus suaveolens* Champ. ex Benth.								+
Apocynaceae	*Trachelospermum jasminoides* (Lindl.) Lem.							++	
Aquifoliaceae	*Ilex asprella* (Hook. & Arn.) Champ.ex Benth.								+
Aquifoliaceae	*Ilex chapaensis* Merr.							++	++
Aquifoliaceae	*Ilex rotunda* Thunb.			+	++				
Araliaceae	*Eleutherococcus trifoliatus* (L.) S.Y. Hu			++					
Araliaceae	*Schefflera octophylla* (Lour.) Harms			++	++	++	+++	++	++
Asteraceae	*Ageratum conyzoides* L.		++						
Asteraceae	*Mikania micrantha* Kunth			+++					
Asteraceae	*Vernonia solanifolia* Benth.					+			
Burseraceae	*Canarium album* (Lour.) Raeusch.						++	++	++
Caesalpiniaceae	*Bauhinia championii* (Benth.) Benth.						+		
Caesalpiniaceae	*Bauhinia glauca* (Wall. ex Benth.) Benth.					+			
Caesalpiniaceae	*Bauhinia variegata* L.			+					
Caesalpiniaceae	*Caesalpinia crista* L.						++		
Capparaceae	*Capparis cantoniensis* Lour.								+
Capparaceae	*Crateva trifoliata* (Roxb.) B.S. Sun								+
Caprifoliaceae	*Viburnum odoratissimum* Ker Gawl.			++	++				
Casuarinaceae	*Casuarina equisetifolia* L.			++					
Celastraceae	*Celastrus hindsii* Benth.				++				
Celastraceae	*Celastrus monospermus* Roxb.							+	
Chloranthaceae	*Sarcandra glabra* (Thunb.) Nakai					++	++	++	++
Clusiaceae	*Calophyllum membranaceum* Gardner & Champ.							++	
Clusiaceae	*Cratoxylum cochinchinense* (Lour.) Blume					+++			
Clusiaceae	*Garcinia oblongifolia* Champ. ex Benth.							++	++
Connaraceae	*Rourea microphylla* (Hook. & Arn.) Planch.					++	++	++	
Connaraceae	*Rourea minor* (Gaertn.) Leenh.							+	++
Convolvulaceae	*Ipomoea cairica* (L.) Sweet			+++					
Convolvulaceae	*Ipomoea digitata* L.				+				
Convolvulaceae	*Merremia umbellata* (L.) Hallier. f.			+++					
Daphniphyllaceae	*Daphniphyllum calycinum* Benth				+			++	
Dilleniaceae	*Tetracera asiatica* (Lour.) Hoog.						++	++	

Family	Species	Marsh	Abandoned Farmland	Village	Secondary forest	Feng shui woods			
						Sam To	Ng To	San Uk Ha	Lo Wai
Ebenaceae	*Diospyros eriantha* Champ. ex Benth.					++	++	++	++
Ebenaceae	*Diospyros kaki* Thunb.			++					
Elaeagnaceae	*Elaeagnus loureiri* Champ. ex Benth.					+			++
Elaeocarpaceae	*Elaeocarpus dubius* A. DC.					+++	++	+++	+++
Euphorbiaceae	*Alchornea trewioide*s (Benth.) Muell.-Arg.					+			
Euphorbiaceae	*Antidesma bunius* (L.) Spreng.						+		
Euphorbiaceae	*Antidesma fordii* Hemsl.							++	++
Euphorbiaceae	*Aporosa dioica* (Roxb.) Müll. Arg.					++	++	++	++
Euphorbiaceae	*Bischofia javanica* Blume			++	++	++			
Euphorbiaceae	*Bridelia insulana* Hance (*B. balansae* Tutch.)					++	++	++	++
Euphorbiaceae	*Bridelia tomentosa* Blume				++		++		
Euphorbiaceae	*Claoxylon indicum* (Reinw. ex Bl.) Hassk.			++					
Euphorbiaceae	*Croton tiglium* L.				++				
Euphorbiaceae	*Endospermum chinense* Benth.					+++	++	+++	+++
Euphorbiaceae	*Glochidion wrightii* Benth.					+			
Euphorbiaceae	*Glochidion zeylanicum* (Gaertn.) A. Juss.				++				
Euphorbiaceae	*Macaranga sampsoni* Hance								++
Euphorbiaceae	*Macaranga tanarius* (L.) Müll. Arg.			+++					
Euphorbiaceae	*Mallotus hookerianus* (Seem.) Müll. Arg.								++
Euphorbiaceae	*Phyllanthus reticulatus* Poir.			+++	++				
Euphorbiaceae	*Sapium discolor* (Champ. ex Benth.) Müll.-Arg.	+							
Fagaceae	*Castanopsis fissa* (Champ. ex Benth.) Rehder & E. H. Wilson					++			
Fagaceae	*Castanopsis fordii* Hance							+++	
Gesnariaceae	*Aeschynanthus acuminatus* Wall. ex A. DC.				+				
Hamamelidaceae	*Liquidambar formosana* Hance					++			
Lauraceae	*Cinnamomum camphora* (L.) J. Presl.				++	+	+	+	
Lauraceae	*Cryptocarya concinna* Hance								+
Lauraceae	*Lindera communis* Hemsl.				++	++			
Lauraceae	*Litsea monopetala* (Roxb. ex Baker) Pers.			+	+++	++	++	++	
Lauraceae	*Machilus breviflora* (Benth.) Hemsl.				++		++	++	
Lauraceae	*Machilus chinensis* (Champ. ex Benth.) Hemsl.							++	++
Lauraceae	*Machilus gamblei* King ex Hooker f.					+++		++	+++
Lauraceae	*Machilus pauhoi* Kanehira					++	+++	+++	+++
Malvaceae	*Hibiscus tiliaceus* L.	++							
Malvaceae	*Urena lobata* L.		++						
Melastomataceae	*Blastus cochinchinensis* Lour.								++
Melastomataceae	*Melastoma candidum* D. Don	++	++						
Melastomataceae	*Memecylon ligustrifolium* Champ. ex Benth.								+
Melastomataceae	*Memecylon nigrescens* Hook.								++

Family	Species	Marsh	Abandoned Farmland	Village	Secondary forest	Feng shui woods			
						Sam To	Ng To	San Uk Ha	Lo Wai
	& Arn.								
Menispermaceae	*Cocculus orbiculatus* (L.) DC.						++		
Menispermaceae	*Hypserpa nitida* Miers				+				
Menispermaceae	*Pericampylus glaucus* (Lam.) Merr.				+				
Menispermaceae	*Stephania longa* Lour.				++				
Mimosaceae	*Acacia pennata* (L.) Willd.						++		
Mimosaceae	*Adenanthera pavonina* L.var.*microsperma* (Teijsm.& Binnend.) I. C. Nielsen				+	++	++		+++
Mimosaceae	*Albizia chinensis* (Osbeck) Merr.								+
Mimosaceae	*Albizia corniculata* (Lour.) Druce					++	+		
Mimosaceae	*Entada phaseoloides* (L.) Merr.						+		
Mimosaceae	*Pithecellobium clypearia* (Jack) Benth.						+++		++
Mimosaceae	*Pithecellobium lucidium* Benth.						++	++	
Moraceae	*Artocarpus styracifolius* Pierre					++		++	++
Moraceae	*Artocarpus tonkinensis* A. Chev. ex Gagnep.					+	++		+
Moraceae	*Cudrania cochinchinensis* (Lour.) Kudo et Masam.						++		
Moraceae	*Ficus fistulosa* Reinw. ex Blume					++	++	++	++
Moraceae	*Ficus formosana* Maxim.							++	
Moraceae	*Ficus hirta* Vahl				++			++	
Moraceae	*Ficus hispida* L. f.			++					++
Moraceae	*Ficus langkokensis* Drake					++		++	++
Moraceae	*Ficus microcarpa* L. f.				+			+	
Moraceae	*Ficus nervosa* B. Heyne ex Roth.				++	++	++		
Moraceae	*Ficus pumila* L.				++			++	
Moraceae	*Ficus subulata* Blume				++	+	++		
Moraceae	*Ficus variegata* Blume var. *chlorocarpa* (Benth.) King			+++		++		++	
Moraceae	*Ficus vasculosa* Wall. ex Miq.					++		++	
Myrsinaceae	*Ardisia fordii* Hemsl.							+++	++
Myrsinaceae	*Ardisia hanceana* Mez						+		
Myrsinaceae	*Ardisia quinquegona* Blume					+++	+++	+++	+++
Myrsinaceae	*Maesa japonica* (Thunb.) Moritzi et Zoll.							++	
Myrsinaceae	*Maesa perlarius* (Lour.) Merr.			++	++				
Myrtaceae	*Cleistocalyx operculatus* (Roxb.) Merr. et L. M. Perry	++			+++	++			
Myrtaceae	*Syzygium hancei* Merr. & L. M. Perry					++		++	++
Myrtaceae	*Syzygium jambos* (L.) Alston				++	+++		++	++
Myrtaceae	*Syzygium levinei* (Merr.) Merr. et L. M. Perry					++	++	+++	
Oleaceae	*Jasminum lanceolarium* Roxb.						++		
Oleaceae	*Osmanthus matsumuranus* Hayata					+++	++	+++	+++
Papilionaceae	*Bowringia callicarpa* Champ. ex Benth.						++		
Papilionaceae	*Dalbergia benthami* Prain				+				
Papilionaceae	*Derris alborubra* Hemsl.				++	++			

Family	Species	Marsh	Abandoned Farmland	Village	Secondary forest	Feng shui woods			
						Sam To	Ng To	San Uk Ha	Lo Wai
Papilionaceae	*Mucuna championii* Benth.			+	+++	+			
Papilionaceae	*Pueraria lobata* (Willd.) Ohwi				++		++		
Piperaceae	*Piper hancei* Maxim.						++		
Pittosporaceae	*Pittosporum glabratum* Lindl.					++	++		
Polygonaceae	*Polygonum chinense* L.							+	
Polygonaceae	*Polygonum lapathifolium* L.		+++						
Proteaceae	*Helicia cochinchinensis* Lour.					+		++	+++
Rhamnaceae	*Paliurus ramosissimus* (Lour.) Poir.	++							
Rhamnaceae	*Sageretia thea* (Osbeck) M.C. Johnst.			++					
Rhizophoraceae	*Kandelia candel* (L.) Druce	++							
Rosaceae	*Rubus reflexus* Ker				++		++	++	
Rubiaceae	*Aidia canthioides* (Champ. ex Benth.) Masam.						++	++	
Rubiaceae	*Aidia pycnantha* (Drake) Tirveng.					+++			++
Rubiaceae	*Borreria latifolia* (Aubl.) K. Schum.				++				
Rubiaceae	*Canthium dicoccum* (Gaertn.) Teysmann et Binnedijk					+++		++	++
Rubiaceae	*Diplospora dubia* (Lindl.) Masam.							++	
Rubiaceae	*Lasianthus fordii* Hance						++		
Rubiaceae	*Mussaenda pubescens* W. T. Aiton							++	
Rubiaceae	*Pavetta hongkongensis* Brem.					++	++		
Rubiaceae	*Psychotria asiatica* L.				++		++	+++	+++
Rutaceae	*Acronychia pedunculata* (L.) Miq.							+++	
Rutaceae	*Citrus maxima* (Burm.) Merr.						+		
Rutaceae	*Clausena lansium* (Lour.) Skeels			++	++				+
Rutaceae	*Evodia lepta* (Spreng.) Merr.					++			++
Rutaceae	*Zanthoxylum nitidum* (Roxb.) DC.			+++	++		++		
Sabiaceae	*Meliosma fordii* Hemsl.						+++	++	++
Sapindaceae	*Dimocarpus longan* Lour.			+++	++		+	++	++
Sapindaceae	*Litchi chinensis* Sonn.						+		
Sapotaceae	*Sarcosperma laurinum* (Benth.) Hook. f.					+++	++	+++	
Simarubaceae	*Ailanthus fordii* Noot.								++
Solanaceae	*Solanum torvum* Sw.			++					
Sterculiaceae	*Byttneria aspera* Colebr. ex Wall.				+++		+++	++	++
Sterculiaceae	*Pterospermum heterophyllum* Hance						+++		
Sterculiaceae	*Sterculia lanceolata* Cav.				+++		+++	++	++
Symplocaceae	*Symplocos glauca* (Thunb.) Koidz.					+		++	++
Symplocaceae	*Symplocos lancifolia* Siebold & Zucc.					++			
Theaceae	*Adinandra millettii* (Hook. & Arn.) Benth. & Hook. f. ex Hance						+		
Thymelaeaceae	*Aquilaria sinensis* (Lour.) Spreng.			++		++	++	+++	+++

Family	Species	Marsh	Abandoned Farmland	Village	Secondary forest	Feng shui woods			
						Sam To	Ng To	San Uk Ha	Lo Wai
Tiliaceae	*Microcos paniculata* L.					+			
Ulmaceae	*Celtis timorensis* Span.				+		+		
Ulmaceae	*Gironniera subaequalis* Planch.								+
Verbenaceae	*Clerodendrum inerme* (L.) Gaertn.	++							
Verbenaceae	*Lantana camara* L.		++	+++					
Vitaceae	*Ampelopsis cantoniensis* (Hook. & Arn.) Planch.			++					
Vitaceae	*Cissus repens* Lam.				+				
Monocotyledonae									
Araceae	*Acorus tatarinowii* Schott				+++				
Araceae	*Alocasia cucullata* (Lour.) G. Don			+					
Araceae	*Alocasia macrorrhiza* (L.) Schott				++		++		
Araceae	*Pothos chinensis* (Raf.) Merr.					++	++		
Araceae	*Rhaphidophora hongkongensis* Schott						+		
Cannaceae	*Canna indica* L.	++							
Cyperaceae	*Cyperus malaccensis* Lam. var. *brevifolius* Boeck.	+++							
Cyperaceae	*Hypolytrum nemorum* (Vahl) Spreng.					++		++	
Cyperaceae	*Kyllinga aromatica* (Ridl.) Mattf. & Kunth		++						
Cyperaceae	*Mapania silhetensis* C.B. Clarke						+		
Cyperaceae	*Pycreus polystachyos* (Rottb.) P. Beauv.		++						
Dioscoreaceae	*Dioscorea cirrhosa* Lour.					++			++
Dioscoreaceae	*Dioscorea fordii* Prain & Burkill						+		
Liliaceae	*Heterosmilax japonica* Kunth var. *gaudichaudiana* (Kunth) F.T. Wang & Ts. Tang								+
Liliaceae	*Liriope spicata* (Thunb.) Lour.					++			
Liliaceae	*Smilax lanceifolia* Roxb.					++			
Pandanaceae	*Pandanus austrosinensis* T. L. Wu					++	++	++	
Pandanaceae	*Pandanus tectorius* Parkinson	++							
Poaceae	*Bambusa cornigera* McClure					+			
Poaceae	*Coix lacryma-jobi* L.		++						
Poaceae	*Imperata koenigii* (Retz.) P. Beauv.			++					
Poaceae	*Isachne globosa* (Thunb.) Kuntze		+++						
Poaceae	*Panicum maximum* Jacq.		+++						
Poaceae	*Paspalum conjugatum* Bergius	+++	+++						
Poaceae	*Phragmites australis* (Cav.) Trin. ex Steud.	+++							
Poaceae	*Setaria plicata* (Lam.) T. Cooke				++				
Zingiberaceae	*Alpinia chinensis* (J. König) Roscoe							+++	+++
Zingiberaceae	*Alpinia hainanensis* K. Schum.				+++	++			
Zingiberaceae	*Hedychium coronarium* Koen.	++							

Appendix 3. Plant species recorded at So Lo Pun on 7 August 2003, with relative abundance: +++ = abundant or dominant; ++ = common; + = rare. Species that are Nationally Protected (Protected I or II, following Yu (1999)), Protected in Hong Kong (Protected HK), globally threatened (IUCN, 2002) or globally restricted are indicated.

Family	Scientific names	Secondary Forest	Shrubland	Abandoned farmland	Marsh	Mangrove	Village	Shrub
PTERIDOPHYTA								
Acrostichaceae	*Acrostichum aureum* L.					++		
Adiantacea	*Adiantum flabellulatum* L.	++						
Adiantacea	*Adiantum malesianum* J. Ghatak	+						
Adiantacea	*Adiantum philippense* L.	+						
Aspidiaceae	*Tectaria subtriphylla* (Hook. & Arn.) Copel.	+						
Athyriaceae	*Callipteris esculenta* (Retz.) J.Sm.				++			
Athyriaceae	*Diplazium subsinuatum* (Wall. ex Hook. & Grev.) Tagawa	+						
Blechnaceae	*Blechnum orientale* L.	+++	++					++
Dennstaedtiaceae	*Microlepia hancei* Prantl	++						
Dicksoniaceae	*Cibotium barometz* (L.) J. Sm. (#)	+						
Gleicheniaceae	*Dicranopteris pedata* (Houtt.) Nakaike	++	+++	++				+++
Lindsaeaceae	*Lindsaea ensifolia* Sw.	+						
Lindsaeaceae	*Lindsaea heterophylla* Dryand.	++						
Lindsaeaceae	*Lindsaea orbiculata* (Lam.) Mett. ex Kuhn	++						
Lindsaeaceae	*Stenoloma chusanum* (L.) Ching	++						
Lygodiaceae	*Lygodium japonicum* (Thunb.) Sw.	++						++
Lygodiaceae	*Lygodium scandens* (L.) Sw.	+++		++	++	++	++	++
Nephrolepidaceae	*Nephrolepis auriculata* (L.) Trimea	+						
Osmundaceae	*Osmunda vachellii* Hook.	+						
Polypodiaceae	*Phymatodes longissimma* (Blume) J. Sm.	+						
Polypodiaceae	*Pyrrosia adnascens* (Sw.) Ching	++						
Pteridaceae	*Pteris ensiformis* Burm. f.	++						
Pteridaceae	*Pteris fauriei* Hieron.	+						
Pteridaceae	*Pteris semipinnata* L.	++			++			
Pteridaceae	*Pteridium aquilinum* (L.) Kuhn var. *latiusculum* (Desv.) Underw. ex A. Heller							++
Thelypteridaceae	*Cyclosorus interruptus* (Willd.) H. Ito	++		++	++	++		
Thelypteridaceae	*Cyclosorus parasiticus* (L.) Farw.	++						
Thelypteridaceae	*Macrothelypteriis torresiana* (Gaudich.) Ching				+			
Thelypteridaceae	*Parathelypteris angulariloba*(Ching)	+						

Family	Scientific names	Secondary Forest	Shrubland	Abandoned farmland	Marsh	Mangrove	Village	Shrub
Thelypteridaceae	*Pronephrium simplex* (Hook.) Holttum	++						
Thelypteridaceae	*Pseudocyclosorus ciliatus* (Wall. ex Benth.) Ching	+						
GYMNOSPERMAE								
Gnetaceae	*Gnetum luofuense* C. Y. Cheng	++			+			
Pinaceae	*Pinus massoniana* Lamb.	+						
ANGIOSPERMAE								
Dicotyledonae								
Acanthaceae	*Baphicacanthus cusia* (Nees) Bremek.	+						
Acanthaceae	*Hygrophila salicifolia* (Vahl.) Ness					++		
Acanthaceae	*Thunbergia grandiflora* Roxb.	+						
Acanthaceae	*Saurauia tristyla* DC.	++						
Alangiaceae	*Alangium chinense* (Lour.) Harms.	++						+
Amaranthaceae	*Cyathula prostrata* (L.) Blume				+			
Anacardiaceae	*Choerospondias axillaris* (Roxb.) B.L. Burtt et. A.W. Hill			+				
Anacardiaceae	*Mangifera indica* L. (*)				+			
Anacardiaceae	*Rhus chinensis* Mill.	+				++		++
Anacardiaceae	*Toxicodendron succedaneum* (L.) Kuntze.	++	++					++
Annonaceae	*Desmos chinensis* Lour.	++						+
Annonaceae	*Uvaria grandiflora* Roxb.	+						
Annonaceae	*Uvaria microcarpa* Champ. ex Benth.	++						
Apiaceae	*Centella asiatica* (L.) Urb.			+			+	
Apocynaceae	*Cerbera manghas* L.	+				+		
Apocynaceae	*Pottsia laxiflora* (Blume) Kuntze	+						
Aquifoliaceae	*Ilex asprella* (Hook. et Arn.) Champ.ex Benth.	++						++
Aquifoliaceae	*Ilex pubescens* Hook. & Arn.	+						
Aquifoliaceae	*Ilex rotunda* Thunb.	+				+		
Araliaceae	*Aralia decaisneana* Hance							+
Araliaceae	*Eleutherococcus trifoliatus* (L.) S.Y. Hu	++						++
Araliaceae	*Schefflera heptaphylla* (L.) Frodin	+++	+					
Asclepiadaceae	*Tylophora ovata* (Lindl.) Hook. ex Steud.							+
Asteraceae	*Artemisia indica* Willd.	+						
Asteraceae	*Elephantopus scaber* L.			++				++
Asteraceae	*Elephantopus tomentosus* L.	++						
Asteraceae	*Gynura divaricata* (L.) DC.					+		
Asteraceae	*Mikania micrantha* Kunth	++			+++			
Asteraceae	*Vernonia cumingiana Benth.*	++						

Family	Scientific names	Secondary Forest	Shrubland	Abandoned farmland	Marsh	Mangrove	Village	Shrub
Asteraceae	*Wedelia biflora* (L.) DC.	++					++	
Asteraceae	*Wedelia chinensis* (Osbeck) Merr.	++			++			
Asteraceae	*Wedelia trilobata* (L.) Hitchc. (^)	++						
Burseraceae	*Canarium album* (Lour.) Raeusch.	+						
Cactaceae	*Hylocereus undatus*				+			
Caesalpiniaceae	*Caesalpinia crista* L.	+						
Caprifoliaceae	*Lonicera longiflora*		+					
Caprifoliaceae	*Lonicera macrantha* (D. Don) Spreng.					+		
Caprifoliaceae	*Viburnum odoratissimum* Ker Gawl.	+			+			
Caprifoliaceae	*Viburnum sempervirens* Koch	++						
Celastraceae	*Celastrus hindsii* Benth.	+						
Chloranthaceae	*Sarcandra glabra* (Thunb.) Nakai	++						
Clusiaceae	*Cratoxylum cochinchinense* (Lour.) Blume	+	++					
Connaraceae	*Rourea microphylla* (Hook. & Arn.) Planch.	++						
Connaraceae	*Rourea minor* (Gaertn.) Leenh.	+						
Convolvulaceae	*Ipomoea cairica* (L.) Sweet (^)	++						
Crassulaceae	*Bryophyllum pinnatum* (L. f.) Oken					++		
Daphniphyllaceae	*Daphniphyllum calycinum* Benth	++	+					++
Dilleniaceae	*Tetracera asiatica* (Lour.) Hoog.	++						
Ebenaceae	*Diospyros kaki* Thunb. (*)	+						
Elaeocarpaceae	*Elaeocarpus dubius* A. DC.	++			+			
Euphorbiaceae	*Alchornea trewioide*s (Benth.) Muell.-Arg.	+						
Euphorbiaceae	*Antidesma bunius* (L.) Spreng.	+			+			
Euphorbiaceae	*Antidesma fordii* Hemsl.	+						
Euphorbiaceae	*Antidesma paniculatum* Roxb.			+				
Euphorbiaceae	*Aporosa dioica* (Roxb.) Müll. Arg.	+						++
Euphorbiaceae	*Breynia fruticosa* (L.) Hook. f.	++	+	+				++
Euphorbiaceae	*Bridelia insulana* Hance (*B. balansae* Tutch.)	+						
Euphorbiaceae	*Bridelia tomentosa* Blume	++				+	+	++
Euphorbiaceae	*Claoxylon indicum* (Reinw. ex Bl.) Hassk.	++						
Euphorbiaceae	*Endospermum chinense* Benth.	+						
Euphorbiaceae	*Glochidion eriocarpum* Champ. ex Benth.	++		+				
Euphorbiaceae	*Glochidion hirsutum* (Roxb.) Voigt	+	+		+	+		

Family	Scientific names	Secondary Forest	Shrubland	Abandoned farmland	Marsh	Mangrove	Village	Shrub
Euphorbiaceae	*Glochidion lanceolarium* (Roxb.) Voigt	+						+
Euphorbiaceae	*Glochidion wrightii* Benth.	+						
Euphorbiaceae	*Glochidion zeylanicum* (Gaertn.) A. Juss.	++						
Euphorbiaceae	*Mallotus apelta* (Lour.) Müll. Arg.							+
Euphorbiaceae	*Mallotus hookerianus* (Seem.) Müll. Arg.	+						
Euphorbiaceae	*Mallotus paniculatus* (Lam.) Müll. Arg.				++			++
Euphorbiaceae	*Phyllanthus emblica* L.	++						+
Euphorbiaceae	*Phyllanthus reticulatus* Poir.	+						
Euphorbiaceae	*Sapium discolor* (Champ. ex Benth.) Müll.-Arg.	+						+
Euphorbiaceae	*Sapium sebiferum* (L.) Roxb.	+	+	+	+			+
Fagaceae	*Castanopsis fissa* (Champ. ex Benth.) Rehder et E. H. Wilson	++						
Flacourtaceae	*Scolopia chinensis* (Lour.) Clos					+		
Flacourtaceae	*Scolopia saeva* (Hance) Hance	+						
Goodeniaceae	*Scaevola taccada* (Gaertn.) Roxb.					+		
Lamiaceae	*Anisomeles indica* (L.) Kuntze							+
Lauraceae	*Cassytha filiformis* L.	++						
Lauraceae	*Cinnamomum camphora* (L.) J. Presl.	+			+			
Lauraceae	*Lindera aggregata* (Sims) Kosterm.	++	+					
Lauraceae	*Lindera communis* Hemsl.	+						
Lauraceae	*Litsea glutinosa* (Lour.) C. B. Rob.					++	++	
Lauraceae	*Litsea monopetala* (Roxb. ex Baker) Pers.	+						
Lauraceae	*Litsea rotundifolia* Hemsl. var. *oblongifolia* (Nees) C. K. Allen	++						
Lauraceae	*Machilus breviflora* (Benth.) Hemsl.	+						
Lauraceae	*Machilus gamblei* King ex Hooker f.	++		+				+
Lauraceae	*Machilus pauhoi* Kanehira	+++			++			
Lythraceae	*Rotala rotundifolia* (Buch.-Ham. ex Roxb.) Koehne				++			
Malvaceae	*Hibiscus tiliaceus* L.	+				+++		
Malvaceae	*Thespesia populnea* (L.) Sol. ex Corrêa						+	
Malvaceae	*Urena lobata* L. (^)	++		++				
Malvaceae	*Urena procumbens* L.	+						
Melastomataceae	*Melastoma candidum* D. Don	+++			++	++		+++

Family	Scientific names	Secondary Forest	Shrubland	Abandoned farmland	Marsh	Mangrove	Village	Shrub
Melastomataceae	*Melastoma dodecandrum* Lour.	++						
Melastomataceae	*Melastoma sanguineum* Sims	+++						+++
Mimosaceae	*Pithecellobium clypearia* (Jack) Benth.				++			
Moraceae	*Ficus hirta* Vahl	++						
Moraceae	*Ficus hispida* L. f.	++				++		+
Moraceae	*Ficus microcarpa* L. f.	+						
Moraceae	*Ficus pumila* L.				++			
Moraceae	*Ficus tinctoria* G. Forst. subsp. *gibbosa* (Blume) Corner	+			+			
Moraceae	*Ficus variegata* Blume var. *chlorocarpa* (Benth.) King	++			++			
Myrsinaceae	*Aegiceras corniculatum* (L.) Blanco					++		
Myrsinaceae	*Ardisia crenata* Sims	++						
Myrsinaceae	*Ardisia quinquegona* Blume	+++						
Myrsinaceae	*Embelia laeta* (L.) Mez	++						+
Myrsinaceae	*Maesa japonica* (Thunb.) Moritzi et Zoll.	++		++				
Myrtaceae	*Cleistocalyx operculatus* (Roxb.) Merr. et L. M. Perry	++		+				
Myrtaceae	*Psidium guajava* L. (^)	+						
Myrtaceae	*Rhodomyrtus tomentosa* (Aiton) Hassk.	+++	+++	+++				
Myrtaceae	*Syzygium buxifolium* Hook. & Arn.					+		
Myrtaceae	*Syzygium hancei* Merr. & L. M. Perry	+						
Myrtaceae	*Syzygium jambos* (L.) Alston				+			
Myrtaceae	*Syzygium levinei* (Merr.) Merr. et L. M. Perry	+			+			
Onagraceae	*Ludwigia octovalvis* (Jacq.) Raven			+	+			
Papilionaceae	*Abrus mollis* Hance	+						
Papilionaceae	*Dalbergia benthami* Prain	++	+	+				
Papilionaceae	*Derris alborubra* Hemsl.	+						
Papilionaceae	*Derris trifoliata* Lour.					+		
Papilionaceae	*Millettia nitida* Benth.	++						
Papilionaceae	*Mucuna birdwoodiana* Tutch.	+						
Papilionaceae	*Phyllodium elegans* (Lour.) Desv.	++		++				
Papilionaceae	*Phyllodium pulchellum* (L.) Desv.	+		++		+		+
Papilionaceae	*Pongamia pinnata* (L.) Pierre				+	++		
Papilionaceae	*Pueraria lobata* (Willd.) Ohwi		++				+++	+++
Papilionaceae	*Tadehagi triquetrum* (L.) H. Ohashi	+						
Polygonaceae	*Polygonum lapathifolium* L.			+	++			

Family	Scientific names	Secondary Forest	Shrubland	Abandoned farmland	Marsh	Mangrove	Village	Shrub
Ranunculaceae	*Clematis chinensis*Osbeck	+						
Ranunculaceae	*Clematis crassifolia* Benth.				+			
Rhamnaceae	*Paliurus ramosissimus* (Lour.) Poir.	+						
Rhamnaceae	*Sageretia thea* (Osbeck) M.C. Johnst.	++						
Rhizophoraceae	*Bruguiera gymnorhiza* (L.) Savigny					+		
Rhizophoraceae	*Carallia brachiata* (Lour.) Merr.	+						
Rhizophoraceae	*Kandelia candel* (L.) Druce				+	+++		
Rosaceae	*Rhaphiolepis indica* (L.) Lindl.	++						
Rosaceae	*Rubus reflexus* Ker	++						
Rubiaceae	*Aidia canthioides* (Champ. ex Benth.) Masam.	+						
Rubiaceae	*Catunaregam spinosa* (Thunb.) Tirveng.				+			
Rubiaceae	*Hedyotis hedyotidea* (DC.) Merr.	+						
Rubiaceae	*Morinda umbellata* L.	++						
Rubiaceae	*Pavetta hongkongensis* Brem.	+						
Rubiaceae	*Psychotria asiatica* L.	++						
Rubiaceae	*Psychotria serpens* L.	++			++			+
Rutaceae	*Acronychia pedunculata* (L.) Miq.				++			
Rutaceae	*Atalantia buxifolia* (Poir.) Oliv. ex Benth.	+				++	+	
Rutaceae	*Citrus reticulata* Blanco (*)						+	
Rutaceae	*Evodia lepta* (Spreng.) Merr.			+				+
Rutaceae	*Zanthoxylum avicennae* (Lam.) DC.	++	+					
Rutaceae	*Zanthoxylum nitidum* (Roxb.) DC.	++						+
Sapindaceae	*Dimocarpus longan* Lour.	++				+	++	
Sapindaceae	*Litchi chinensis* Sonn. (*)				+		++	
Scrophulariaceae	*Lindernia crustacea* (L.) F. -Muell.				++			
Sterculiaceae	*Helicteres angustifolia* L.	++	+	++				
Sterculiaceae	*Heritiera littoralis* Dryand.					+		
Sterculiaceae	*Reevesia thyrsoidea* Lindl	+						
Sterculiaceae	*Sterculia lanceolata* Cav.	++						
Symplocaceae	*Symplocos glauca* (Thunb.) Koidz.	+						
Theaceae	*Camellia salicifolia* Champ. ex Benth.				+			
Theaceae	*Eurya chinensis* R. Br.	++						
Thymelaeaceae	*Aquilaria sinensis* (Lour.) Spreng. (~, #, 1)	+						
Tiliaceae	*Microcos paniculata* L.	+						
Urticaceae	*Boehmeria nivea* (L.)				+			

Family	Scientific names	Secondary Forest	Shrubland	Abandoned farmland	Marsh	Mangrove	Village	Shrub
	Gaudich.							
Verbenaceae	*Avicennia marina* (Forssk.) Vierh.					+		
Verbenaceae	*Callicarpa nudiflora* Hook. & Arn.	++						
Verbenaceae	*Clerodendrum cyrtophyllum* Turcz.	+						
Verbenaceae	*Clerodendrum inerme* (L.) Gaertn.	++						
Verbenaceae	*Duranta erecta* L. (*)						++	
Verbenaceae	*Lantana camara* L. (^)	++		++		++	+++	++
Verbenaceae	*Vitex negundo* L.	++				++	++	++
Verbenaceae	*Vitex quinata* (Lour.) F.N. Williams	+						
Verbenaceae	*Vitex rotundifolia* L. f.	++						
Vitaceae	*Ampelopsis cantoniensis* (Hook. & Arn.) Planch.	+						
Vitaceae	*Cayratia corniculata (Benth.) Gagnep.*				+			
Vitaceae	*Cissus repens* Lam.				+			
Monocotyledonae								
Amaryllidaceae	*Crinum asiaticum L. var. sinicum* (Roxb. ex Herb.) Baker				+			
Amaryllidaceae	*Hymenocallis littoralis* (Jacq.) Salisb.	+						
Araceae	*Acorus tatarinowii* Schott	+						
Araceae	*Alocasia cucullata* (Lour.) G. Don	++						
Araceae	*Alocasia macrorrhiza* (L.) Schott	+			+			
Araceae	*Rhaphidophora hongkongensis* Schott	+						
Areaceae	*Daemonorops margaritae* (Hance) Becc.	+						
Commelinaceae	*Commelina communis* L.					++		
Commelinaceae	*Commelina diffusa* Burm. f.			++				
Commelinaceae	*Floscopa scandens* Lour.					+		
Cyperaceae	*Cyperus haspans* L.			++	++			
Cyperaceae	*Cyperus malaccensis* Lam. var. *brevifolius* Boeck.					+++		
Cyperaceae	*Cyperus pilosus* Vahl				++			
Cyperaceae	*Eleocharis dulcis (*Burm. f.) Trim. ex Hensch.					+		
Cyperaceae	*Fimbristylis aestivalis* (Retz.) Vahl				++			
Cyperaceae	*Fimbristylis subbispicata* Nees & Meyen				++			
Cyperaceae	*Gahnia tristis* Nees	++						
Cyperaceae	*Pycreus polystachyos* (Rottb.) P. Beauv.				++	++		
Dioscoreaceae	*Dioscorea bulbifera* L.	++						
Liliaceae	*Asparagus cochinchinensis* (Lour.) Merr.	+						
Liliaceae	*Smilax china* L.	++						++

Family	Scientific names	Secondary Forest	Shrubland	Abandoned farmland	Marsh	Mangrove	Village	Shrub
Liliaceae	*Smilax glabra* Roxb.	+	++					
Marantaceae	*Phrynium rheedei* Suresh & Nicolson				+			
Pandanaceae	*Pandanus forceps* Martelli	+						
Pandanaceae	*Pandanus tectorius* Parkinson					+++		
Poaceae	*Arundinella nepalensis* Trin.		++			+		
Poaceae	*Centotheca lappacea*	++						
Poaceae	*Chrysopogon aciculatus* (Retz.) Trin.			+++				+
Poaceae	*Cynodon dactylon* (L.) Pers. (^)			+++				
Poaceae	*Imperata koenigii* (Retz.) P. Beauv.			++				
Poaceae	*Lophatherum gracile* Brongn.	++						
Poaceae	*Miscanthus floridulus* (Labill.) Warb. ex K. Schum & Lauterb.	++						+++
Poaceae	*Miscanthus sinensis* Andersson		++	++				
Poaceae	*Paspalum orbiculare* Forst.				++			
Poaceae	*Phragmites australis* (Cav.) Trin. ex Steud.					++		
Zingiberaceae	*Alpinia hainanensis* K. Schum.	+						
Zingiberaceae	*Alpinia officinarum* Hance							+

Remarks:

#: Protected in China
~: Proected in Hong Kong
^: Exotic species
*: Planted or cultivated species
1: vulnerable

Appendix 4. Vascular plants of Yung Shue Au recorded in the 7 August 2003 survey (excluding Orchidaceae), with an index of local abundance: "+" = rare; "++" = common; "+++" = abundant. Species that are Nationally Protected (Protected I or II, following Yu (1999)), Protected in Hong Kong (Protected HK), globally Threatened (IUCN, 2002) or globally restricted are indicated.

Family	Scientific names	*Feng Shui* Wood	Secondary Forest	Shrub	Marsh	Mangrove	Village
PTERIDOPHYTA							
Adiantacea	*Adiantum flabellulatum* L.	++	+++				
Aspidiaceae	*Hemigramma decurrens* (Hook.) Copel.	+					
Aspidiaceae	*Tectaria subtriphylla* (Hook. & Arn.) Copel.		+				
Blechnaceae	*Blechnum orientale* L.		+				
Dicksoniaceae	*Cibotium barometz* (L.) J. Sm. (#)		+				
Lygodiaceae	*Lygodium japonicum* (Thunb.) Sw.		+++				++
Lygodiaceae	*Lygodium scandens* (L.) Sw.				++		+
Nephrolepidaceae	*Nephrolepis auriculata* (L.) Trimea		+				+
Nephrolepidaceae	*Nephrolepis hirsutula* (G. Forst.) C. Presl				++		
Osmundaceae	*Osmunda vachellii* Hook.		++				
Pteridaceae	*Pteris semipinnata* L.	++	++				
Pteridaceae	*Pteris vittata* L.						++
Thelypteridaceae	*Cyclosorus interruptus* (Willd.) H. Ito				+		
Thelypteridaceae	*Cyclosorus parasiticus* (L.) Farw.	++					
Thelypteridaceae	*Macrothelypteriis torresiana* (Gaudich.) Ching						+
GYMNOSPERMAE							
Gnetaceae	*Gnetum luofuense* C. Y. Cheng	++					
Pinaceae	*Pinus massoniana* Lamb.			++			
ANGIOSPERMAE							
Dicotyledonae							
Actinidiaceae	*Saurauia tristyla* DC.		++				
Alangiaceae	*Alangium chinense* (Lour.) Harms.						++
Anacardiaceae	*Rhus chinensis* Mill.				++		
Anacardiaceae	*Toxicodendron succedaneum* (L.) Kuntze.	++	++				
Annonaceae	*Uvaria microcarpa* Champ. ex Benth.	++	++				
Apocynaceae	*Alyxia sinensis* Champ. ex Benth.	+					
Apocynaceae	*Cerbera manghas* L.	+					
Apocynaceae	*Melodinus suaveolens* Champ. ex Benth.	+					
Apocynaceae	*Strophanthus divaricatus* (Lour.) Hook. & Arn.	++					
Apocynaceae	*Thevetia peruviana* (Pers.) Schum. (*)						+
Aquifoliaceae	*Ilex asprella* (Hook. et Arn.) Champ.ex Benth.	++		+			

Family	Scientific names	*Feng Shui* Wood	Secondary Forest	Shrub	Marsh	Mangrove	Village
Aquifoliaceae	*Ilex pubescens* Hook. & Arn.			+			
Araliaceae	*Schefflera heptaphylla* (L.) Frodin	++	++	++	++		
Asteraceae	*Anisopappus chinensis* (L.) Hook. & Arn.				+		
Asteraceae	*Artemisia indica* Willd.						+
Asteraceae	*Ageratum conyzoides* L. (^)				++		
Asteraceae	*Mikania micrantha* Kunth				++		+
Asteraceae	*Wedelia chinensis* (Osbeck) Merr.				+		
Burseraceae	*Canarium album* (Lour.) Raeusch.		+				
Celastraceae	*Euonymus nitidus* Benth.	+					
Chloranthaceae	*Sarcandra glabra* (Thunb.) Nakai	++					
Clusiaceae	*Cratoxylum cochinchinense* (Lour.) Blume		++				
Connaraceae	*Rourea microphylla* (Hook. & Arn.) Planch.	++					
Connaraceae	*Rourea minor* (Gaertn.) Leenh.	+					
Crassulaceae	*Bryophyllum pinnatum* (L. f.) Oken						+
Dilleniaceae	*Tetracera asiatica* (Lour.) Hoog.	++					
Ebenaceae	*Diospyros eriantha* Champ. ex Benth.		+				
Ebenaceae	*Diospyros morrisiana* Hance ex. Walpers			+			
Ebenaceae	*Diospyros vaccinioides* Lindl.	+					
Ericaceae	*Rhododendron simsii* Planch. (~)			+			
Escalloniaceae	*Itea chinensis* Hook. & Arn			+			
Euphorbiaceae	*Alchornea trewioide*s (Benth.) Muell.-Arg.	++					
Euphorbiaceae	*Antidesma bunius* (L.) Spreng.	+					
Euphorbiaceae	*Aporosa dioica* (Roxb.) Müll. Arg.	+					
Euphorbiaceae	*Breynia fruticosa* (L.) Hook. f.				+		
Euphorbiaceae	*Bridelia insulana* Hance	+	+				
Euphorbiaceae	*Bridelia tomentosa* Blume		++		+		+
Euphorbiaceae	*Glochidion eriocarpum* Champ. ex Benth.		+				
Euphorbiaceae	*Glochidion lanceolarium* (Roxb.) Voigt		+				
Euphorbiaceae	*Mallotus hookerianus* (Seem.) Müll. Arg.		+				
Euphorbiaceae	*Mallotus paniculatus* (Lam.) Müll. Arg.	++			++		
Euphorbiaceae	*Phyllanthus cochinchinensis* (Lour.) Spreng.			++			
Euphorbiaceae	*Phyllanthus reticulatus* Poir.						++
Euphorbiaceae	*Sapium discolor* (Champ. ex Benth.) Müll.-Arg.			++			
Euphorbiaceae	*Sapium sebiferum* (L.) Roxb.				+		
Fagaceae	*Castanopsis fissa* (Champ. ex Benth.) Rehder et E. H.	+	++				

Family	Scientific names	*Feng Shui* Wood	Secondary Forest	Shrub	Marsh	Mangrove	Village
	Wilson						
Lamiaceae	*Anisomeles indica* (L.) Kuntze				+		
Lauraceae	*Cinnamomum camphora* (L.) J. Presl.		+				
Lauraceae	*Lindera aggregata* (Sims) Kosterm.			++			
Lauraceae	*Lindera communis* Hemsl.	+					
Lauraceae	*Litsea glutinosa* (Lour.) C. B. Rob.	++	++				++
Lauraceae	*Litsea rotundifolia* Hemsl. var. *oblongifolia* (Nees) C. K. Allen		+++	+++			
Lauraceae	*Machilus breviflora* (Benth.) Hemsl.	++	+				
Lauraceae	*Machilus chinensis* (Champ. ex Benth.) Hemsl.	+					
Lauraceae	*Machilus gamblei* King ex Hooker f.	++					
Lauraceae	*Machilus pauhoi* Kanehira	+					
Lauraceae	*Machilus velutina* Champ. ex Benth.	++	+				
Loganiaceae	*Strychnos umbellata* (Lour.) Merr.	+					
Loranthaceae	*Taxillus chinensis* (DC.) Danser	++					+
Malvaceae	*Hibiscus tiliaceus* L.					+	+
Melastomataceae	*Melastoma sanguineum* Sims			+++			
Menispermaceae	*Pericampylus glaucus* (Lam.) Merr.				+		
Mimosaceae	*Acacia pennata* (L.) Willd.		++				
Moraceae	*Ficus formosana* Maxim.	+	+				
Moraceae	*Ficus hirta* Vahl	++					
Moraceae	*Ficus hispida* L. f.		++		+		++
Moraceae	*Ficus microcarpa* L. f.	+					
Moraceae	*Ficus pumila* L.						++
Moraceae	*Ficus subulata* Blume		+				
Moraceae	*Ficus variegata* Blume var. *chlorocarpa* (Benth.) King	++					
Moraceae	*Ficus variolosa* Lindl. ex Benth.			++			
Myrsinaceae	*Ardisia lindleyana* D. Dietr.	+		+			
Myrsinaceae	*Ardisia quinquegona* Blume	++	+++				
Myrtaceae	*Cleistocalyx operculatus* (Roxb.) Merr. et L. M. Perry	+	++		++		
Myrtaceae	*Lophostemon confertus* (R. Br.) P.G. Wilson & J.T. Waterhouse (^)	+					
Myrtaceae	*Rhodomyrtus tomentosa* (Aiton) Hassk.			+++			
Myrtaceae	*Syzygium hancei* Merr. & L. M. Perry		++				
Myrtaceae	*Syzygium levinei* (Merr.) Merr. & L.M. Perry	++	+				
Oleaceae	*Osmanthus matsumuranus* Hayata	+					
Oxalidaceae	*Oxalis corymbosa* DC.				+		
Papilionaceae	*Abrus mollis* Hance		+	+			
Papilionaceae	*Canavalia rosea* (Sw.) DC.					+	
Papilionaceae	*Dalbergia hancei* Benth.		+				

Family	Scientific names	*Feng Shui* Wood	Secondary Forest	Shrub	Marsh	Mangrove	Village
Papilionaceae	*Derris alborubra* Hemsl.		+				
Papilionaceae	*Millettia nitida* Benth.	+		++			
Papilionaceae	*Pueraria lobata* (Willd.) Ohwi		++		+++		
Rhamnaceae	*Sageretia thea* (Osbeck) M.C. Johnst.						++
Rhizophoraceae	*Carallia brachiata* (Lour.) Merr.		+				
Rhizophoraceae	*Kandelia candel* (L.) Druce					+	
Rosaceae	*Photinia benthamiana* Hance	+					
Rosaceae	*Rubus parvifolius* L.						+
Rubiaceae	*Adina pilulifera* (Lam.) Franch. ex Drake		++				
Rubiaceae	*Aidia canthioides* (Champ. ex Benth.) Masam.	+	+				
Rubiaceae	*Canthium dicoccum* (Gaertn.) Teysmann et Binnedijk	+					
Rubiaceae	*Gardenia jasminoides* J. Ellis			+			
Rubiaceae	*Paederia scandens* (Lour.) Merr.						++
Rubiaceae	*Pavetta arenosa* Lour.		++				
Rubiaceae	*Psychotria asiatica* L.	+++	+++				
Rubiaceae	*Psychotria serpens* L.	++					
Rutaceae	*Acronychia pedunculata* (L.) Miq.	++					
Rutaceae	*Zanthoxylum avicennae* (Lam.) DC.		+				
Santalaceae	*Dendrotrophe frutescens* (Champ. ex Benth.) Danser			+			
Sapindaceae	*Dimocarpus longan* Lour.	++	+				+
Sapotaceae	*Sarcosperma laurinum* (Benth.) Hook. f.	+					
Sterculiaceae	*Byttneria aspera* Colebr. ex Wall.		++				
Sterculiaceae	*Sterculia lanceolata* Cav.	++	+++				
Symplocaceae	*Symplocos glauca* (Thunb.) Koidz.		+				
Theaceae	*Adinandra millettii* (Hook. & Arn.) Benth. & Hook. f. ex Hance			+			
Thymelaeaceae	*Aquilaria sinensis* (Lour.) Spreng. (~, #, 1)	++	++	+			
Tiliaceae	*Microcos paniculata* L.	+					
Ulmaceae	*Celtis tetrandra* Roxb. subsp. *sinensis* (Pers.) Y.C. Tang						++
Verbenaceae	*Lantana camara* L. (^)		++		++		+++
Verbenaceae	*Vitex negundo* L.	++			+++		
Vitaceae	*Cissus repens* Lam.						++
Monocotyledonae							
Araceae	*Alocasia cucullata* (Lour.) G. Don				++		
Araceae	*Alocasia macrorrhiza* (L.) Schott	+					
Cyperaceae	*Cyperus javanicus* Houtt.						+
Cyperaceae	*Gahnia tristis* Nees			++			
Cyperaceae	*Kyllinga brevifolia* Rottb.		+				+
Cyperaceae	*Scleria terrestris* (L.) Fassett			+++			
Dioscoreaceae	*Dioscorea bulbifera* L.						+
Dioscoreaceae	*Dioscorea cirrhosa* Lour.	+					

Family	Scientific names	*Feng Shui* Wood	Secondary Forest	Shrub	Marsh	Mangrove	Village
Liliaceae	*Asparagus cochinchinensis* (Lour.) Merr.		+				
Liliaceae	*Hemerocallis citrina* Baroni	+					
Liliaceae	*Lilium brownii* F.E. Brown ex Miellez			++			
Liliaceae	*Smilax china* L.			+++			
Marantaceae	*Pandanus forceps* Martelli		+				
Poaceae	*Centotheca lappacea*		+				
Poaceae	*Imperata koenigii* (Retz.) P. Beauv.				++		
Poaceae	*Lophatherum gracile* Brongn.		++				
Poaceae	*Microstegium ciliatum* (Trin.) A. Camus				++		++
Poaceae	*Miscanthus floridulus* (Labill.) Warb. ex K. Schum et Lauterb.			+++	+++		++
Poaceae	*Paspalum orbiculare* Forst.						+
Poaceae	*Phragmites australis* (Cav.) Trin. ex Steud.					+++	
Zingiberaceae	*Alpinia oblongifolia* Hayata	++					

Remarks

#: Protected in China
~: Proected in Hong Kong
^: Exotic species
*: Planted or cultivated species
1: vulnerable

Plate 1 Lin Ma Hang *feng shui* wood with Wutongshan Forest Park, Shenzhen in the background. A corridor between Wutongshan and Robin's Nest would be expected to enhance the movement of wildlife between these areas (Credit: Captain Wong KFBG).

Plate 2. Secondary forest at Lin Ma Hang. This secondary forest is of conservation concern as the rare fern, *Gymnosphaera metteniana*, has been discovered here. An infrared camera trapping exercise in July 2003 also revealed that a wide range of wildlife makes use of the forest, including the Indian Muntijac (*Munitacus muntjak*), of "Potential Regional Concern", and the Orange-headed Thrush (*Zoothera citrinus*) of "Local Concern" (Credit: Captain Wong KFBG).

Plate 3. The lowland stream at Lin Ma Hang – in which a total of 13 freshwater fish species have been recorded, including *Rasbora steineri*, of "Global Concern" and *Mastacembelus armatus* of "Local Concern". A Site of Special Scientific Interest proposal was submitted to the Town Planning Board in 1999 by the University of Hong Kong but is still under consideration. This stream is threatened by a proposed channelization project (Credit: Captain Wong KFBG).

Plate 4. An Indian Muntjac (*Munitacus muntjak*) at Lin Ma Hang, captured on infrared camera in July 2003. This photo indicates that the animal was active in the daytime, as patches of sunlight can be seen in the background (Credit: Kadoorie Farm and Botanic Garden).

Plate 5. An Orange-headed Thrush (*Zoothera citrinus*; inside the red circle) at Lin Ma Hang. The photo was taken by an infrared camera in July 2003. The Orange-headed Thrush is primarily a winter visitor to Hong Kong but this photo record indicates that the bird is probably a summer visitor or resident of the Lin Ma Hang secondary forest (Credit: Kadoorie Farm and Botanic Garden).

Plate 6. Greater bent-winged bat (*Miniopterus magnater*). Lin Ma Hang is the most important wintering roost known for this species in Hong Kong (Credit: Gary Ades KFBG).

Plate 7. Secondary forest at San Kwai Tin. The forest has probably regenerated over the last 30 to 40 years. Three snake species of conservation concern were recorded here: Anderson's Stream Snake (*Opisthotropis andersonii*), the Diamond-backed Water Snake (*Sinonatrix aequifasciata*), and the Mountain Wolf Snake (*Lycodon ruhstrati*). Please note that highway construction was being conducted at the foot of Wutongshan, Shenzhen when this photo was taken in 2002 (Credit: Captain Wong KFBG).

Plate 8. A Mountain Wolf Snake (*Lycodon ruhstrati*) at San Kwai Tin. This species is regarded to be of Local Concern and has previously been recorded at only five sites in Hong Kong (Credit: Lee Kwok Shing KFBG).

Plate 9. *Ugia purpurea* (Lepidoiptera: Noctuidae) at San Kwai Tin. To date, this recently described species has only been recorded in Hong Kong (Credit: Roger Kendrick)

Plate 10. The landscape at Kuk Po (Credit: Paul Crow KFBG).

Plate 11. A group of juvenile wild boar (*Sus scrofa*) at Kuk Po. This photo was taken by an infrared camera (Credit: Kadoorie Farm and Botanic Garden).

Plate 12. Understorey of the secondary forest at So Lo Pun. Major canopy species recorded include *Schefflera heptaphylla, Machilus pauhoi, M. gamblei, Castanopsis fissa, Cleistocalyx operculatus, Dimocarpus longan,* and *Elaeocarpus dubius* (Credit: Captain Wong).

Plate 13. A Crab-eating Mongoose (*Herpestes urva*), a species of Local Concern, at So Lo Pun. This photo was taken by an infrared camera in December 2003. The species was thought in the 1990s to be restricted to the Deep Bay area, but was recorded by the AFCD in both Plover Cove and Pat Sin Leng Country Parks in 2002 (Credit: Kadoorie Farm and Botanic Garden).

Plate 14. A Chinese Leopard Cat (*Prionailarus bengalensis*) at So Lo Pun. Although this species is widespread in Hong Kong, few direct sightings have been made (Credit: Kadoorie Farm and Botanic Garden).

Plate 15. A Yellow-bellied Weasel (*Mustela kathiah*; inside the red circle) at So Lo Pun. Although the origin of this species in Hong Kong is under debate, it is distributed throughout southern and central China and is an inhabitant of hill forests. It is therefore believed that this species is native to Hong Kong and that its current occurrence may simply represent re-colonisation or range expansion (Credit: Kadoorie Farm and Botanic Garden).

Plate 16. A Big-headed Frog (*Rana fujianensis*), a species of Local Concern, at So Lo Pun. First recorded at So Lo Pun in 1999, it had previously been found mainly in the central New Territories (Credit: Paul Crow).

Plate 17. The abandoned village and *feng shui* wood at Yung Shue Au. Although only two infrared cameras were installed here, the results showed that mammal occurrence and activity at Yung Shue Au was higher than at the other areas in this study (Credit: Paul Crow).

Plate 18. Mammals at Yung Shue Au (A: Indian Muntjac (*Muntiacus muntjak*), B: Malayan Porcupine (*Hystrix brachyura*), C: Small Indian Civet (*Viverricula indica*), and D: Wild Boar (*Sus scrofa*)). All were taken by the same infrared camera in December 2003 (Credit: Kadoorie Farm and Botanic Garden).

Plate 19. A male *Stiphodon* sp. at Yung Shue Au. The presence of this species of Global Concern demonstrates the high ecological importance of the lowland streams at Yung Shue Au (Credit: Captain Wong KFBG).

Plate 20. Mikania invasion of the lowlands of Lin Ma Hang. Such an invasion could result in loss of plant biodiversity (Credit: Captain Wong KFBG).

Plate 21. An endemic Hong Kong Paradise Fish in captivity at a farm at Kuk Po. Currently, no freshwater fish species are protected in Hong Kong (Credit: Captain Wong KFBG).

Plate 22. Barbecue facilitates at a farm at Kuk Po. Degradation of habitats is anticipated if unplanned recreational activities are conducted (Credit: Captain Wong KFBG).

Plate 23. Although Wutongshan and Robin's Nest are separated by a highway, the valley between them could serve as a corridor for the movement of wildlife between the two places (Credit: Captain Wong KFBG).